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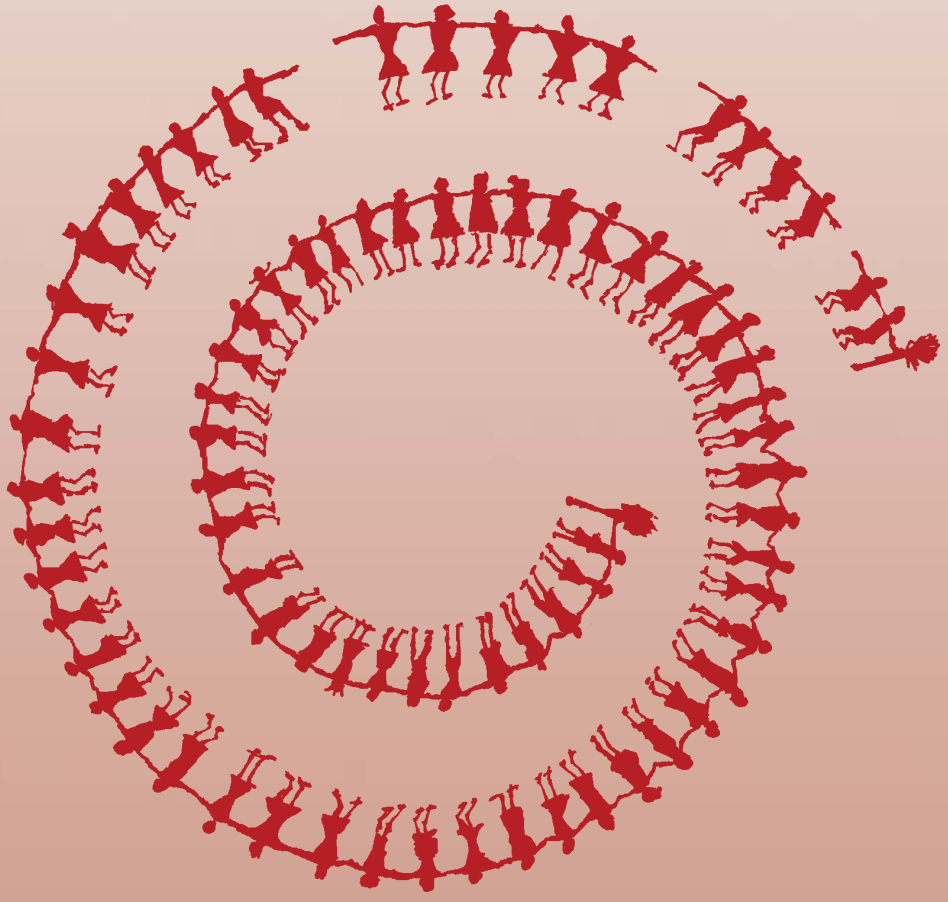
Pakistan's Public Health Surveillance System: A Call to Action

August 15, 2005



Discussion Paper Series

PAKISTAN'S PUBLIC HEALTH SURVEILLANCE SYSTEM:

A CALL TO ACTION

A Joint Assessment by the Ministry of Health, the Government of Pakistan, the World Health Organization, the Centers for Disease Control and Prevention, and the World Bank

South Asia Human Development Unit
South Asia Region
The World Bank

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LIST OF ABBREVIATIONS AND ACRONYMS

AEFI	Adverse Events Following Immunization
AFP	Acute Flaccid Paralysis
AFIP	Armed Forces Institute of Pathology
AIDS	Acquired Immune Deficiency Syndrome
AJK	Azad Jammu and Kashmir
AKU	Aga Khan University
APHL	American Public Health Laboratories
BOD	Burden of Disease
BPS	Basic Pay Scale
BHU	Basic Health Unit
BRF	Behavioral Risk Factor
BSc	Bachelor of Science
CBRC	Computerized Birth Registration Certificate
CCHF	Crimean-Congo Hemorrhagic Fever
CDC	Centers for Disease Control and Prevention (U.S.)
CPSP	College of Physicians and Surgeons of Pakistan
DCO	District Coordinating Officer
DEWS	Disease Early Warning System
DFID	Department for International Development
DHQ	District Headquarter Hospital
DHS	District Health Services
DHO	District Health Officer
DHDC	District Health Development Centers
DOH	Department of Health
DST	District Surveillance Team
ECA	Eastern Europe and Central Asia
ED	Executive Director
EDO-H	Executive District Officer, Health
EIC	Epidemic Investigation Cell
EMRO	Eastern Mediterranean Regional Office
EPI	Expanded Program of Immunization
EPR	Epidemic Preparedness and Response
FANA	Federally Administered Northern Areas
FBS	Federal Bureau of Statistics
FELTP	Field Epidemiology and Laboratory Training Program
FLCF	First Level Care Facility
FP	Family Planning
GOP	Government of Pakistan
GDP	Gross Domestic Product
GNP	Gross National Product
HIV	Human Immuno-Deficiency Virus
HMIS	Health Management Information System
HSA	Health Services Academy

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HW	Health Worker
ICD	International Classification of Diseases
IHR	International Health Regulations
IMR	Infant Mortality Rate
IPH	Institute of Public Health
JICA	Japanese International Cooperation Agency
LHW	Lady Health Workers
MCH	Maternal and Child Health
MDG	Millennium Development Goals
MMR	Maternal Mortality Ratio
MOH	Ministry of Health
MOU	Memorandum of Agreement
MPH	Masters in Public Health
MREO	Monitoring Research Evaluation Officer
NADRA	National Database and Registration Authority
NAP	National Action Plan for the Prevention and Control of Non-communicable Diseases and Health Promotion
NCD	Non-communicable Diseases
NIH	National Institute of Health
NIPS	National Institute of Population Studies
OPD	Out-patient Department
PAP	Pakistan Association of Pathologists
PDS	Pakistan Demographic Survey
PHSA	Provincial Health Services Academy
PHDC	Provincial Health Development Center
PIHS	Pakistan Integrated Household Survey
PIMS	Pakistan Institute of Medical Sciences
PMRC	Pakistan Medical Research Council
RHC	Rural Health Center
SARS	Severe Acute Respiratory Syndrome
SAVVY	Sample Vital Registration and Verbal Autopsy
SCF	Save the Children Fund
TB	Tuberculosis
THQ	Tehsil or Taluka Headquarter Hospital
UN	United Nations
UNFPA	United Nations Population Fund
VR	Vital Registration
VS	Vital Statistics
WHO	World Health Organization

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EXECUTIVE SUMMARY OF KEY FINDINGS AND RECOMMENDATIONS

In Pakistan, the fraction of the burden of disease that is preventable is large and disproportionately borne by the poor. Improved health outcomes require effective prevention and disease control measures, which in turn require investments in public health surveillance, a recognized public good and responsibility of government. The well-functioning AFP/polio surveillance system in Pakistan contributed substantially to the dramatic decrease in polio incidence, and to the very real possibility that polio transmission will soon be interrupted. This achievement shows that disease control, and even the elimination of diseases, is possible in Pakistan when adequate surveillance activities are carried out. Suffering and death in Pakistan from still common communicable diseases such as measles, human rabies, typhoid, and cholera are also preventable. Public health surveillance has played an important role in eliminating those diseases from other developing countries. Emerging disease threats, such as Severe Acute Respiratory Syndrome (SARS) and avian influenza, provide further impetus for establishing effective public health surveillance. Finally, achieving the health-related MDGs, including those related to infant and maternal mortality, is more likely when public health surveillance is functioning, with vital statistics as an integral component.

Because of the importance of surveillance in improving health outcomes, a joint assessment of Pakistan's public health surveillance system was undertaken during 2004-2005 by the Ministry of Health, the Government of Pakistan, the World Health Organization, the Centers for Disease Control and Prevention, and the World Bank. The assessment provides information about the current status of public health surveillance and steps necessary to improve and strengthen disease surveillance and response activities. The recommendations resulting from this assessment should provide timely information to the Ministry of Health which is elaborating a National Action Plan for public health surveillance as part of the PRSC process.

This assessment considered three major areas of public health surveillance: (1) communicable diseases, (2) vital registration with a focus on maternal and infant mortality, and (3) non-communicable diseases and risk factors. The key recommendations for each of these areas are summarized below. A stepwise approach to implementing these recommendations should be considered in the National Action Plan. Chapter 4 summarizes some of the major cross-cutting issues and provides a minimum package to develop the public health surveillance system.

COMMUNICABLE DISEASE SURVEILLANCE

Establish discrete surveillance units at federal, provincial and district levels that are responsible for coordinating all surveillance activities, including disease detection and response. These units should be distinct from the Health Management Information System (HMIS). A single clearly identified focal point at each administrative level is particularly important. Initially, the focal point should be established at the federal level to provide leadership and to integrate existing fragmented programs into a unified, information-producing and response system. Currently, the few surveillance activities that exist are distributed between groups in the Ministry of Health/Department of Health (MOH/DOH), national programs, and the National Institute of Health (NIH). The task of a national surveillance unit would be to develop national standards and case definitions; to produce guidelines on how to conduct surveillance for specific diseases; to receive disease reports from all programs for synthesis and analysis; and to coordinate response efforts and to evaluate the impact of resulting actions. The unit should also

develop plans to incorporate the private and academic sector facilities into the surveillance system. This entity would also be responsible for making disease information available to policy-makers, providing feedback to submitters and other interested stakeholders, and functioning as the focal-point for international reporting, which is required under International Health Regulations. There should be corresponding units at provincial and district levels with crosscutting surveillance data analyses and use functions. These should be managed by trained field epidemiologists with clear position descriptions and training and experience requirements. These units also should identify a laboratory coordinator at all levels to coordinate the laboratory response in outbreaks and to integrate laboratory diagnostics into routine surveillance.

Develop a legal framework that mandates notification of priority diseases by all health sectors and clearly defines each administrative level's responsibilities for disease prevention and control. While a legal framework will not improve disease surveillance by itself, it will provide the basis of legitimacy for the efforts by all stakeholders. A physician's ethical requirement to protect patients' privacy must be balanced by the public's right to protection from disease. A legal mandate is required to assure timely and complete reporting from all sectors. Therefore the national action plan should indicate how this is to be accomplished. Furthermore, the roles and responsibilities of each administrative level, the health facilities, and the private sector must be defined in order for the system to function effectively.

Transition AFP/polio surveillance system into the health system's mainstream. The AFP/polio surveillance system is top-notch and should serve as the foundation on which to build effective communicable disease surveillance in Pakistan. The system can be considered the gold standard that works from the community level to the First Level Care Facility (FLCF), through all administrative levels, the laboratory and the private sector. It incorporates all the essential functions of an ideal surveillance system. The system has the potential for expansion and tenuous efforts have been made to expand it by incorporating measles and neonatal tetanus surveillance. However, the system is also very well resourced and supported by the WHO as part of the international drive to eradicate polio. Whether the system as it currently exists could be sustained is questionable. A realistic plan is needed so that the AFP surveillance is fully absorbed and financed by the Ministry and Departments of Health thereby assuring its sustainability and potential as a base for the surveillance of additional diseases.

Surveillance and response activities must be functionally integrated across programs. The currently fragmented system creates inefficiencies and increases work loads at all levels but particularly at the district level. Expansion of current surveillance to other priority diseases would be difficult to sustain if individual structures are created for each disease. An integrated approach, with a common system for multiple diseases using similar structures, processes, and personnel, is much more efficient, less costly, and promotes a more effective use of resources. This approach permits the slow construction of a surveillance system and the incorporation of increasing numbers of diseases as resources allow. The gradual build up and integration is particularly important at the district level where the numbers of cases are smaller and resources are limited.

Increase resource sharing among programs. Some of the vertical programs have an abundance of donor-provided resources while others have very limited resources. Activities such as supervision, digitalization and analysis of data, could be more efficiently and effectively carried out if resources (e.g., human resources, vehicles, computers) are shared. This is particularly true at the district level where activities such as supervision and use of computers are more efficiently done when all programs participate. Some sharing of resources at the district level was noted and

this should be systematized for all disease surveillance and response programs. An integrated surveillance system would foster resource sharing.

Build health workers' capacity for improved surveillance, disease prevention/control, and outbreak response. A comprehensive analysis and plan of the competencies and resulting training requirements for a communicable disease surveillance and response work force is needed in the areas of applied epidemiology, surveillance, outbreak investigation and response, case investigation and management, the 21st century public health laboratory in disease monitoring and outbreak response, public health informatics (including computer training), communications, and management and policy development. This analysis should include the need for, and utilization of, a field epidemiology and laboratory training program in Pakistan, as well as the potential role of distance-based training. Appropriate training methods and institutes' and certification requirements should be part of the workforce development plan. This plan should be linked to career plans that assure utilization and retention of trained persons in appropriate positions and pay scales at all administrative levels.

Develop a public health laboratory network (PHLN) linked with other components of surveillance. Currently no public health laboratory network exists. The AFP/polio surveillance only uses the national laboratory to confirm cases. Specific plans for a functional PHLN must be developed. Laboratory diagnostic capacity is an essential component of sound public health surveillance. At present there is minimal laboratory capacity to confirm clinically diagnosed cases of priority diseases, utilize information on cases where the laboratory is the primary source of the diagnosis, and determine the etiology of unknown cases of illness or disease outbreaks. It is not possible to develop a 21st century surveillance system without a functional network of reliable laboratories. The PHLN plan should map the laboratories to become part of the network, identify existing gaps, assess equipment and training needs, develop standards and guidelines, monitor performance through a national quality assurance program, develop protocols for confirmatory/reference testing, and create a regulatory framework. A fundamental requirement is to plan how the laboratory system will communicate and collaborate with surveillance units at all administrative levels and how data from laboratories and surveillance unites are shared and used. The PHLN should function within the context of the national surveillance system.

Elaborate a long-term plan to modernize the public health surveillance information and data transmission systems. A 21st century surveillance system must take advantage of 21st century informatics opportunities. The Pakistani disease surveillance system continues to be largely paper driven. The lack of access to electronic data severely limits the system's timeliness and analytic capacity. Many sites have independently developed their own software package. Therefore, the various sites lack the ability to communicate with each other electronically. Standardization of both hardware and software packages is necessary to transform the surveillance system to meet current requirements. Privacy concerns also will need to be addressed. Relevant training and reporting formats and standards should be included in the informatics component of the plan.

Assure the use of surveillance information for public health interventions.
Surveillance is distinct from ordinary information systems. It involves the **use** of information for timely **action** to prevent and control diseases. This requires at all administrative levels a public health surveillance workforce with adequate guidelines, trained to analyze, interpret, and translate information into effective public health interventions, which works closely with decision-makers and disease control programs. No matter how well a surveillance system identifies and reports diseases, unless those reports lead to appropriate actions, the public health status of the population will not be changed.

Provide committed financing for public health surveillance: A functioning surveillance system requires commitment which ensures sustainable financing. Surveillance is primarily a government function. In close collaboration with the provincial governments, the federal government should take a lead role in developing a financing plan for surveillance. Initially, the federal government should finance the development and implementation of the system for five years. Financing should be phased by the provincial and district governments for activities undertaken at the provincial and district levels. The AFP/polio surveillance system costs approximately US 1.5 million annually. Further study is required to determine the costs of expanding this system, integrating it with other systems within a single surveillance unit, and making necessary investments in informatics and laboratories etc. to develop a well-functioning public health surveillance system.

VITAL REGISTRATION / STATISTICS AND MCH SURVEILLANCE

Vital Registration and Statistics

Elaborate a long-term plan (10 year) to develop a complete vital registration and statistics system. Given the current very low levels of vital registration, achieving full coverage will take time. The National Database and Registration Authority (NADRA) has begun piloting a vital registration system and estimates 80% coverage over 3-5 years. This will require a collaborative effort between union councils, health districts and community health workers (LHWs, vaccinators, etc.) However, reaching the remaining 20% of the population will take longer. A ten-year timeline seems reasonable to attain full coverage.

Work with NADRA and union councils to assure the successful expansion of the Lahore pilot for birth and death registration to other districts and to improve the health information obtained. Once the pilot in Lahore and Sialkot are completed the computerized process of birth and death registration will be expanded to all union councils. The potential benefits of a system providing data vital to health cannot be overstated. In order to capitalize on this potential, the MOH should designate a technical group to work with NADRA as the system expands. The technical group should also work with NADRA to improve the information being collected and to ensure the inclusion of the health data which is documented on the WHO recommended birth and death certificates. Community health workers will be a very important force in helping to assure that all births and deaths are registered. Full and complete registration will require coordination with the MOH.

Standardize birth and death certificates using WHO recommendations. The standardized birth certificates provide a wealth of information on risk factors (such as birth weight, birth complications, type of delivery etc.). This information is important for the development of effective interventions to improve maternal and neonatal outcomes. Standardized death certificates include not only the immediate cause of death but the underlying causes. Standardized birth and death certificates may not be appropriate for community births and deaths but should be developed and utilized in hospitals and other health facilities.

Strengthen the coverage of birth and death reporting in the short- and medium-term through MCH programs (LHW, HMIS, hospitals, and private sector). Ongoing birth and death reporting via the LHW-MIS should be strengthened to increase coverage and studies carried out to validate the completeness of the coverage of births and maternal, infant and child deaths. Hospital data on births and deaths should be incorporated into the district reporting system. The private sector should be slowly involved in the reporting process.

In the medium term implement a SAVVY (Sample Vital Registration and Verbal Autopsy) system that provides at a minimum annual national and provincial level estimates for cause-specific mortality rates and risk factors. A SAVVY system can be a source of demographic and mortality information that is representative at the national, provincial and potentially even at the district level. It can play a role in filling information gaps while the vital registration system is being developed. It would provide a continuous stream of information and play a role in system development. The verbal and social autopsy components would provide valuable information about why the person died. The costs of providing representative information at the district level would have to be assessed. A SAVVY system could be phased in over time as part of a plan to build a complete vital registration system. Ideally, all age groups would be included in the verbal autopsy system. Nevertheless, depending on costs, the verbal autopsies could be limited to certain age groups of particular interest e.g., children and women of reproductive age.

MCH Surveillance

Develop and finance an effective MCH organizational structure at all administrative levels. There is no unit at the national level responsible for providing leadership and coordination to the disparate MCH programs currently being implemented. Policy-making is piecemeal and implementation of policies is ineffective. Reductions in maternal and infant mortality have clearly been established as top health priorities. A unit responsible for MCH activities should be established at each level to ensure that the country's health goals will be reached.

Develop more comprehensive information systems particularly at the district level. The JICA project has undertaken an extensive evaluation of the Health Management Information System (HMIS). The following recommendations echo some of those of the JICA project:

- ***Consolidate MCH information from various sources at the district level.*** Information from LHW-MIS and HMIS should be consolidated at the district level to provide a comprehensive picture of the MCH situation.
- ***Include standardized hospital information to permit a systems approach to analysis of the MCH situation.*** The referral system for obstetric emergencies is a key strategy for maternal and infant morality reduction. Hospital information is crucial for understanding how well the system is working, including the timeliness of referrals and the quality of care provided.
- ***Strengthen and expand the system of verbal autopsies to provide better information for decision-making.*** After the initial evaluation of the first full year of verbal autopsies, consideration should be given to expanding the data collection instrument to include other information about a woman's cause of death in addition to the clinical reason. Such information could help develop more effective interventions to reduce maternal deaths.
- ***Build capacity (aggregation, analysis, utilization).*** At all levels, capacity-building in data collection, aggregation, analysis, interpretation and particularly utilization for policy development, planning, intervention implementation, and monitoring performance and results is critical to achieving MCH objectives.

NON-COMMUNICABLE DISEASE AND BEHAVIORAL RISK FACTOR SURVEILLANCE

Implement the NCD National Action Plan. The NAP is a comprehensive document with an action agenda for each of the targeted NCD and risk factors. However, this comprehensive plan

cannot be implemented overnight. Priorities are defined in the NAP and a phased approach to rolling them out should be agreed upon. Roles and responsibilities for carrying out the priority actions will need to be defined. Broader dissemination of the document and discussion of how to implement the action agenda could be accomplished through a series of consultation meetings with provinces and districts. A summary document targeted toward high-level decision makers would also be helpful. Potentially, surveillance could be used as an entry point to enhance collaboration across all levels (federal, provincial, district). The timing is advantageous, as the pilot population-based risk factor survey will soon be expanded for national implementation.

Clearly delineate roles and responsibilities across public/private partners. NAP is being implemented through a novel public-private arrangement. However greater policy support is needed for this implementation design; the terms of reference and the structural and procedural parameters of such an arrangement should be strengthened. Roles and responsibilities of partners need to be well-defined.

Polices, priorities, roles and resources allocations need to be clearly demarcated at the three levels of government with regard to the implementation of the NAP, and its linkage with services at these levels. In particular, a surveillance coordinating mechanism needs to be developed with both the mandate and the capability of collecting, interpreting and utilizing the data for decision making at each of these levels. A mechanism for periodically bringing partners together to address new issues and tasks as they arise could help maintain momentum and energy. In the public sector, NCD/risk factor surveillance units should be established at all provincial departments of health and in key districts with appropriate coordination and interface between all levels. Ideally risk factor surveillance would have central oversight at the federal level to help ensure data consistency and quality.

Assure completion of national, population-based risk factor survey and transition to an ongoing surveillance system. An evaluation of the risk factor survey pilot conducted in Rawalpindi District is planned and improvements will be made prior to national data collection. A budget has been allocated for the expansion of the pilot to national surveillance implementation. The planning and budget for a repeated cycle of national data collection should already be prepared once the first national risk factor survey has been completed.

Strengthen capacity to plan, implement, and evaluate surveillance, research, and interventions through the development and implementation of comprehensive public health NCD prevention and control training package. A continuous education system to strengthen data collection, analysis, interpretation, and reporting is necessary, as well as the capacity to translate data into public health action to prevent chronic diseases. Such a system would support the training of professionals to perform specialized surveillance functions (e.g., data coders and information technology specialists), and would consist of a package of training programs designed to enhance NCD prevention and control. Traditional infectious disease and clinical training are insufficient because the NCD field requires a paradigm shift from outbreaks to prevention. Public health solutions require the involvement of multiple sectors covering psychological, social, political, and environmental dimensions. Public health partners have begun implementing courses such as the WHO/CDC Evidence-Based Public Health: A Course in Chronic Disease Prevention, which can be incorporated into the training package.

Involve the use of sample vital registration and sentinel sites to enhance chronic disease prevention and control activities. A sample vital registration system would be very useful for monitoring NCD trends and the impact of interventions. Such a system is recommended for maternal and infant mortality surveillance and is discussed in greater detail in Chapter 2. During

the August 2004 consultation on NCD surveillance road traffic crashes and burns were emphasized as health priorities. They should be addressed through sentinel site surveillance.

Improve hospital data collection and use. Begin strengthening hospital data collection by focusing first on hospitals with stronger infrastructure, and then expand data collection improvements to other hospitals over time. Update hospital coding schemes from ICD-8 to ICD-10. Develop a standardized hospital reporting form to be submitted for oversight to a central location. Keep the reporting system simple (as few fields as possible). Employ hospital health statistics and information technology staff to advance record keeping and reporting. Identify federal incentives for physician compliance in the accurate reporting/coding of death and diseases.

Replicate the Karachi cancer registry protocol in other sites and link registries to a national system. The Karachi cancer registry is the only registry in Pakistan that conforms to international standards. As recommended in the NAP, these standards should be replicated in a defined number of sites that receive sustainable support to provide good, continuous data on representative populations.

Consider working with development partner to obtain resources for NCD surveillance, prevention, and control. Greater support is needed for the implementation of the NAP by involving bilateral and/or multilateral agencies. Increased support will enable the strengthening of capacity and increase the program's visibility. Emphasis should be placed on training, improving surveillance and data collection activities, implementing effective programs, and producing scientific publications.

PAKISTAN'S PUBLIC HEALTH SURVEILLANCE SYSTEM: A CALL TO ACTION

BACKGROUND

Pakistan lags behind its neighbors and many other low-income countries in terms of health and population outcomes. The infant mortality rate of 77[1] per 1,000 live births is higher than the averages for low-income countries and South Asia by 10% and 16% respectively.[2] An analysis of the burden of disease carried out by the Bank in 1996[3] (Table 1) showed that approximately 60% of the burden of disease are preventable or readily treatable diseases affecting primarily young children and women of reproductive age. Pakistan is one of few countries in the world that still has indigenous polio. At the same time, the burden of largely preventable non-communicable diseases appears to be increasing. The major impact of all these diseases is borne by poor segments of society and vulnerable groups.

Communicable diseases in Pakistan account for 40% of the burden of disease and 45% of mortality. Polio remains prevalent and measles alone constitutes 8% of all under-five deaths. There is a high incidence of other vaccine-preventable diseases, including hepatitis B and neonatal tetanus. Other communicable diseases, such as tuberculosis, malaria, typhoid, hepatitis C, acute respiratory infections and diarrhea are also of significant public health importance. The incidence of tuberculosis is estimated at 177 cases per 100,000 per year, one of the highest in the world. While the incidence of malaria cases ranges between 2 to 5 cases per 1,000, 37% of which are of the deadly *falciparum* type.[4]

Table 1: Composition of the Burden of Disease (BOD)

Cause	% Share
Communicable Diseases	40
Reproductive Health Problems	12
Injuries	11
Cardiovascular Diseases	10
Nutrition Deficiencies	6
Others	21

Thus, the major health challenge facing Pakistan is the slow progress in improving indicators related to child health, maternal health, and morbidity and mortality caused by communicable diseases. These areas are an integral part of the Millennium Development Goals (MDGs) 4, 5 and 6.[5] The National Health Policy includes the implementation of strategies for protecting people against hazardous diseases and for promoting public health. The overall national vision for the health sector is based on a "Health for All" approach.

A key challenge in the health sector will be to ensure the strengthening and the effective implementation of public health programs in the devolving work environment. Devolution (decentralization) can be conducive to program implementation in public health through increased local accountability and improved management. However, there are also risks. The districts lack capacity in planning, financial management and human resource management, and building capacity for effective management will take time.

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[1] Pakistan Demographic Survey, 2001 (unpublished results).
[2] Pakistan Integrated Household Survey, 2001/02, Federal Bureau of Statistics, Islamabad.
[3] Pakistan: Towards Health Sector Strategy, World Bank, 1998.
[4] Draft MDG Report for Pakistan, 2003.
[5] Millennium Development Goals: (4) reduce child mortality; (5) improve maternal health; (6) combat HIV/AIDS, malaria, and other diseases.

Health surveillance is considered a global public good.[6] The Latin American cholera epidemic of 1991-2, the Indian plague epidemic in 1994, and the Asian SARS epidemic in 2003 are evidence of the human suffering and economic devastation caused by diseases that potentially can be prevented and controlled. The WHO and the World Bank cite public health surveillance as an essential function of a public health system.[7] It is a critical component of health systems and fundamental to the principles of health stewardship that are considered part of the government's domain. Surveillance is an important source of health information. It is vital for effective decision-making that leads to timely activities for epidemic control and preventing the transmission of communicable diseases. In addition, surveillance information improves efficiency and effectiveness of health services by appropriately targeting interventions and scarce health resources to where they are most needed.

> ***Public Health Surveillance*** is the ongoing systematic collection, analysis, and interpretation of health data essential for planning, implementing, and evaluating public health activities, closely integrated with timely dissemination of the data to enable effective and efficient action to be taken to prevent and control disease.

While communicable diseases form the basis of a public health surveillance system, surveillance of maternal and infant mortality as well as of non-communicable diseases and their risk factors are important additional components. Birth and death registration are key elements for effectively monitoring maternal and infant mortality, particularly in the context of a decentralized health system. Periodic health surveys such as the DHS generally provide information only at the national level and are not useful for decision making at the district level. In addition, periodic health survey information is not very timely. The data usually lags behind by approximately 5 years thus further limiting its usefulness for public health policy-making, planning, efficient resource allocation, and monitoring even at the national level. Vital statistics provide information that is much more useful to decision-making at the local level and for targeting interventions and resources more effectively. Such information can potentially be very useful in accelerating attainment of the maternal and child health MDGs. However, a major problem is its coverage and the quality of the information obtained.

Over the next 10 years, Pakistan will likely undergo an epidemiologic and demographic health transition. In fact, this transition probably has occurred already in urban areas. Health issues of the urban population, particularly the urban poor, are usually different from those in rural areas. Behavioral risk factors (BRF) such as smoking, unhealthy diet, and lack of physical activity tend to be much more prevalent in urban areas. Those factors play an important role in the development of NCD that are otherwise preventable. Furthermore, the high costs of care for these often preventable NCD (e.g., heart disease, cancer, diabetes) place a burden on the health care system and require the displacement of resources that could be used otherwise. The Ministry of Health estimates that 30% of the population suffers from non-communicable diseases. In response, the MOH is developing a national plan of action for NCD. Surveillance of NCD and BRF should be a part of this plan in order to understand the prevalence of these problems and monitor the impact of prevention activities.

The devolution of political, administrative and financial powers to the district governments has begun only recently in Pakistan. The health sector is undergoing reorganization in line with the devolution initiative, including the redefining of the roles and responsibilities of the district and provincial levels of the health system. At present, surveillance is a federal responsibility.

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[6] Zacher M. Global Epidemiological Surveillance. Chapter in: Kaul I., Grunberg I., Stern M. (eds.) Global Public Goods. Oxford University Press; 1999.

[7] Public health and World Bank operations. World Bank, Human Development Network, 2002.

However, public health surveillance responsibilities at the provincial and district levels need to be clarified. This is therefore an opportune moment to influence the development of the public health surveillance system. A successful system requires capacity at all three levels but particularly at the local/district. It is at this level where diseases are first identified and reported, and where many control measures must take place.

Given the MOH's stated interest in strengthening Pakistan's public health surveillance and disease control, this assessment will provide valuable information about necessary requirement in training, infrastructure, communications, and technology that is not currently available.

Elements of Surveillance Systems

There are many types of surveillance systems, which vary from very simple to complex. However, all surveillance systems include the key elements summarized in Box 1. The detection of a health event under surveillance leads to a cascade of pre-defined follow-up activities including the investigation and confirmation of the case through the collection of further information and laboratory specimens as needed. As noted previously, central to the concept of surveillance is that it serves as a stimulus to action. Collection of data without an accompanying plan for using the data to address health problems is a waste of resources.

BOX 1. Key elements of surveillance systems

All surveillance systems involve six key elements:

1. Detection and notification of a health event
2. Investigation and confirmation (epidemiological, clinical, laboratory)
3. Collection of data
4. Analysis and interpretation of data
5. Feedback and dissemination of results
6. Response—a link to public health programs, specifically *actions* for prevention and control.

Source: Adapted from WHO 1999a.

Objectives of the Assessment

The overall objective of this assessment is to evaluate the public health surveillance system in Pakistan and to provide information necessary to plan for its strengthening. The evaluation will assess three areas of public health surveillance with an emphasis on communicable diseases:

- communicable disease surveillance
- the vital registration system with a focus on maternal and infant mortality surveillance
- non-communicable and behavioral risk factor surveillance

This assessment provides a snapshot of the current status of these three areas of public health surveillance in Pakistan. It also summarizes the strengths, gaps and broad recommendations for improving surveillance in each area. There are many publications that review in detail the theory, concepts, and practice of public health surveillance.[8] They provide additional important technical information that is useful for the elaboration of a National Action Plan. Follow-up studies looking at costs and implementation details will be necessary once the National Action Plan is completed.

[8] Teutsch S. and Churchill R. eds. Principles and practice of public health surveillance. Oxford University Press, New York. 2000. Halperin W. and Baker L. eds. Public health surveillance. Van Nostrand Reinhold, New York. 1992. McQueen D. and Puska P. eds. Global behavioral risk factor surveillance. Kluwer Academic/Plenum Publishers. New York. 2003. Abreu A, Halperin W, Danel I. Public health surveillance toolkit. World Bank. 2002.

CHAPTER 1: COMMUNICABLE DISEASE SURVEILLANCE

1.1 Background

The communicable disease burden in Pakistan is much higher than in many other countries with similar GDPs. This burden is borne largely by the poor. An effective communicable disease surveillance system is a prerequisite to decreasing this burden and the suffering it causes. As will be noted in this chapter, Pakistan has already addressed polio and is close to interrupting the chain of transmission. This success could not have been realized without the AFP/polio surveillance system. Other communicable diseases that have been controlled and even eliminated in other developing countries include measles, rabies, typhoid, and cholera. Yet these diseases continue to present large burdens in Pakistan. The threat of emerging communicable diseases such as SARS and avian influenza provides further stimulus for developing an effective surveillance system. This chapter summarizes the current status of communicable disease surveillance in Pakistan and some steps necessary to develop an effective communicable disease surveillance system.

1.2 Methodology

The assessment was carried out utilizing an instrument developed by the WHO. The instrument is a combination of questionnaires for use at various levels of the health system, by a variety of key players, and in different health facilities and laboratories. Some of the questionnaires are very structured, while others are open-ended, particularly those used in interviews with policy-makers. The questionnaires were field tested in Islamabad prior to beginning the assessment and adapted to the Pakistani context. In order to more efficiently carry out the assessment, the joint mission members were divided into two teams composed of representatives from each of the agencies. Each team visited two provinces. The questionnaires were applied at the national level in a variety of settings, at the provincial level in all four provinces, in at least one district office in each of the provinces, and in a variety of facilities in the districts visited. Both quantitative and qualitative information was obtained during the assessment and entered into a computerized data base developed by the WHO. The full report using the WHO's methodology is shown in Annex 1. The report provides a wide range of information and a much more detailed analysis of the current status of Pakistan's communicable disease surveillance system, including a wealth of technical recommendations. Chapter 1 provides a summary of the main findings and recommendations.

1.3 Current Surveillance and Information Systems - Strengths and Weaknesses

Table 2 summarizes the surveillance and information systems that currently function in Pakistan. A review of the strengths and weaknesses of each system follows:

Table 2: Communicable disease information systems currently available in Pakistan.*

Name	Number of diseases / syndromes reported	Set-up	Frequency of reporting
EPI	6	Vertical	Monthly
AFP/Polio (+ measles, tetanus)	1 (+2)	Vertical	Immediate
Malaria	2	Vertical	Monthly
HIV/AIDS	1	Vertical	Quarterly
TB-DOTS	1	Vertical	Quarterly
DEWS	16	Decentralized	Immediate/weekly
HMIS	18	Decentralized	Monthly

* Adapted from a presentation by Dr. Khalif Bile Mohammad, WHO Representative in Pakistan, in pre-assessment workshop.

1.3.1 AFP / Expanded AFP Surveillance

Because of the global effort to eradicate polio, considerable resources have been invested by Pakistan and multiple development partners to mount an effective AFP surveillance system in Pakistan, which remains one of a handful of countries in the world that still has indigenous polio. The result is a model surveillance system that already has had an impact in reducing the number of polio cases to 46 in 2004. The system and its impact are described in detail in Box 2. The presence of AFP surveillance is felt at every level of the health care system from the community to health facilities – primary and hospital, public and private – to the district, provincial and national levels of the health sector. Because of significant development partner support for this effort, the system has considerable human and material resources at its disposal. All the various types of personnel necessary to maintain a surveillance system have been trained, from epidemiologists to computer data entry personnel to laboratory staff. Seventy polio surveillance officers have been trained and are scattered in key locations throughout the country. A specimen collection and transport system has been developed with links to the national laboratory at the NIH where polio is confirmed or ruled-out. One of the main factors contributing to the success of this system is the availability of sufficient resources for adequate oversight and supervision. All the essential elements of a surveillance system are embodied in the AFP surveillance system. Its success has created among health workers a sense of expectation and enthusiasm about the possibility of controlling other communicable diseases in Pakistan. The AFP/polio surveillance system has created a foundation on which to build surveillance activities for other priority diseases.

However, the large amount of resources available for polio from development partner is unlikely to be available for other types of disease surveillance, prevention and control. The system as it stands is unlikely to be sustainable for the long-term. Once polio is eliminated, ongoing polio surveillance and control activities will have to be tailored to a more modest budget. At the same time, as interest in polio wanes, ongoing, necessary polio activities are unlikely to continue unless the system is expanded to include other diseases.

In fact, efforts are already underway to expand the diseases under surveillance by this system. In several parts of the country cases of measles and neonatal tetanus are also being reported via the AFP/polio surveillance structure. However, the effort is still nascent. While a polio case automatically results in an investigation and disease control activities such as vaccination, the same is not true for measles and neonatal tetanus. These systems still focus on counting numbers and monitoring. They do not incorporate *action* or response, an essential element of surveillance.

1.3.2 EPI Surveillance

A vertical, monthly reporting system exists for diseases covered by EPI. Reports are sent from by districts to the provincial and on to the national level. The national level aggregates and analyzes data and produces EPI reports that are disseminated back to the provinces. However, the EPI reporting system is limited to counting numbers. There is no case investigation or laboratory confirmation, and cases do not trigger any specific disease prevention and control measures. The reporting system seems to be used primarily as a way of monitoring the success of EPI vaccination efforts. The numbers of cases reported are low and it is likely they significantly underestimate the true number of cases. As noted above, the program has started measles and neonatal tetanus surveillance through the AFP/Polio surveillance system, but at present it is limited to disease notification and aggregation of numbers without any response.

BOX 2. Acute Flaccid Paralysis / Polio Surveillance: a key to eradication

Pakistan's AFP/polio surveillance system was started in 1988. However, the progress of polio eradication in Pakistan was stagnant, with 1,147 cases reported in 1997, requiring further intensification of activities. Support from development partners subsequently was increased substantially thereby enabling the allocation of more resources to the program including staff, training, computerized information systems, and laboratory support.

The goal of the AFP/polio surveillance system is to detect every case of childhood AFP, investigate it (e.g., find out if the child is immunized), collect a stool specimen to confirm or discard the diagnosis of polio, and carry out control activities. While only about 1 out of 200 AFP cases reported was truly polio in 2004, this effort is necessary if polio is to be eradicated. Detection requires a cadre of trained individuals at every level of the health care system, including in communities where cases are usually first detected. LHWs and other community health personnel have been trained to report AFP cases and refer them to the FLCF or District Health Office. The child is subsequently examined by a surveillance medical officer and information obtained about recent travel in order to try and ascertain where s/he might have had contact with polio and whether s/he had been vaccinated. Information about other risk factors is also collected and later analyzed for targeting high-risk groups in immunization campaigns. A stool specimen is collected and transported to the National Laboratory for testing to confirm poliomyelitis. The results of the test are reported back down the reporting chain.

All AFP cases are reported immediately to the next level – either by phone, FAX, post, or electronically. The community worker reports to the FLCF, and information is then transmitted to the district and on to the provincial and national offices. A cadre of trained AFP surveillance officers is available to follow-up AFP cases and ensures that each case is investigated, the proper testing is carried out, and the results are documented. Reporting is done on paper initially from the community level, or by phone in the case of physicians. The involvement of community members, non-licensed practitioners, and LHWs has improved the timeliness of reporting as well as the ability to provide timely technical assistance. A national toll free number has been installed, which rings at the appropriate district health office, to facilitate case reporting.

The fact that a stool sample is required to confirm a case has necessitated the creation of a specimen collection and transport system. While only the National Laboratory can test for polio in Pakistan (and so the system has not created a public health laboratory network per se) it has raised awareness among health workers about the importance of laboratory confirmation.

Nevertheless, this system has required considerable investment. Since 1997, approximately US$1 million has been invested annually in surveillance activities. (The budget for 2005 is US$ 1.5 million). 40,000 - 50,000 workers have been trained in a variety of aspects of surveillance. Sufficient budget is allocated for monitoring and supervision to assure that guidelines are understood and followed, and to investigate problems when they occur.

The AFP/polio surveillance system has been very successful and has lead to an increase in the number of AFP cases reported and tested (over 2,000 annually), and an increase in focused control activities. This was essential in reducing the number of polio cases reported in Pakistan from 1,147 in 1997 to 54 in 2004. Only 4 cases were confirmed in the first quarter of 2005 and there is a good chance transmission will be interrupted in 2005.

1.3.3 TB and HIV/AIDS Surveillance

The HIV/AIDS and TB control programs have information systems that are used to monitor these diseases. Both of these surveillance systems are self-contained, vertical systems that are tied directly to the respective programs. Roles and responsibilities have been clearly delineated in

both systems and the chain of reporting seems to work well, though timeliness is an issue. The systems seem to function relatively well. However, the quality and completeness of information have not been assessed, and laboratory support is often inadequate. The HIV/AIDS program includes a network of sentinel surveillance sites and is the only system in Pakistan to incorporate such a concept. The program is working to develop second generation HIV/AIDS surveillance system including sero-surveillance and behavioral surveillance of vulnerable population sub-groups. TB surveillance uses a quarterly reporting system. This is appropriate for management decision-making in TB, though not for many other communicable diseases. Both systems are highly vertical and have not been integrated with other disease surveillance and control activities.

1.3.4 Disease Early Warning System – DEWS

DEWS surveillance was established in 2001 as a joint effort by the MOH and the WHO with technical support from the John Hopkins University. Its objective is early detection of an outbreak so that action can be taken to prevent illness and death. DEWS involves the use of a daily/weekly reporting form for several communicable diseases and a weekly watch chart which incorporates the concept of graphically depicting baseline and threshold levels to assist in the identification of an outbreak (when the number of cases identified is higher than the usual number). Capacity building has been carried out randomly in some of the districts (and in some cases in the private sector) with a total of 1965 staff trained. Case definitions and watch charts for six diseases (acute watery diarrhea, meningitis, viral hepatitis, malaria, typhoid, and measles) have been distributed to most health facilities, mainly FLCFs. There is a DEWS cell in the NIH that imparts training and receives, analyzes and summarizes information that is transmitted through the HMIS.

This system has great potential and theoretically could be very helpful in monitoring priority communicable diseases and identifying outbreaks. It is likely that DEWS has helped increase awareness of surveillance for these 6 diseases. However, while weekly watch charts were found to be hanging on the walls in many health facilities that participated in this assessment, in no case were they actually being filled out or used systematically to monitor diseases and to identify outbreaks. There was little evidence that case definitions were being applied or followed. In fact, most health facilities did not have readily available case definitions for any disease except AFP/polio. To achieve its goals, DEWS cannot succeed unless it receives sufficient political, management and financial backing with adequate supervision and incentives. Such support was not evident. Its linkage to HMIS reduces its potential for timely reporting. DEWS is lacking an adequate plan to make it fully operational, and does not have the necessary structure, resources or other support that are required to operationalize it successfully. *Although the concept is good, especially in a resource-limited setting, the current utilization of DEWS in Pakistan has not been maximized and the lessons imparted need to be considered for the establishment or strengthening of any surveillance system.*

1.3.5 LHW Information System

The national program for Primary Health Care and Family Planning is an extension of the health care delivery system providing community based services through Lady Health Workers (LHW). The national program operates its own system of information; data is collected and compiled by the LHW and transmitted through FLCFs to the district and onward to the provincial and federal levels. Information generated by the LHW system is consolidated and used separately from HMIS at all levels. Lady health workers have limited or no public health training. Nonetheless, they are key community informants for a variety of health issues including identification of AFP cases and child mortality and morbidity (e.g., diarrhea cases). There is a fear that giving LHW

further responsibilities, including a greater role in surveillance, may overburden them and detract from their ability to be effective in their primary role as promoters of maternal and child health.

1.3.6 Health Management Information System

The National HMIS is designed to support the management information needs of the MOH and its allied provincial/district departments. In its current form, the HMIS principally provides information from the first level care facilities, which are mainly primary health care providers. HMIS now covers 117 out of 120 districts. The THQs, DHQs, and tertiary hospitals do not provide information to the HMIS, although the THQs and DHQs in Sindh use the HMIS in out-patient departments. The private sector, which is responsible for the bulk of health care in the country, does not participate in the HMIS.

The HMIS form collects a variety of information on 118 curative, preventive and management related indicators. This includes reporting cases of 18 communicable diseases. However, it is not a surveillance system per se in that response or control activities related to the reporting of these diseases are not a component. The information theoretically flows up the chain from first level care facilities to district, provincial and national levels where it is summarized to use for planning and management purposes.

In most health facilities visited during this assessment, the HMIS was indeed functioning. Most facilities have OPD visit registers and other instruments where information is compiled daily. In the facilities we visited there seemed to be a good culture of compiling data and reporting it monthly. In some sporadic cases, the medical officer in charge of the health facility did take the initiative to investigate what seemed to be an outbreak when the numbers of cases increased (e.g., diarrhea). HMIS has an immediate reporting form; however, in places visited, it was either not available or rarely if ever used. There was little evidence that HMIS data was used as a tool for management decisions at the primary care level. At the national level, several documents have been published and disseminated using data from this system, but these are not produced in a timely fashion. A large evaluation of HMIS is being carried out (the JICA study) and the World Bank financed assessment was limited to considering HMIS as a tool for public health surveillance. The HMIS in its present form has several important gaps. It is limited to the public sector out-patient setting, and thus gives a very limited and skewed picture of the occurrence of targeted diseases. While it collects information, it is not tied to response and action as integral components and there is little evidence that it is used in this way.

1.3.7 Communicable Disease Surveillance and HMIS

Both surveillance and HMIS have as their ultimate goal the improved health status of the population. Surveillance achieves this through disease detection, prevention and control activities, while HMIS does so by helping assure good quality health care services. While there may be some overlap between the two systems, there are also significant differences (see Box 3 next page). The major difference is related to the type of response generated by a health event under surveillance. In order to achieve its objective of disease prevention and control, particularly during outbreaks and epidemics or disease elimination efforts, the response to information collected for surveillance purposes is often immediate and triggers a well-defined cascade of activities and control measures. AFP/polio is a good example. The identification of an AFP case immediately results in an investigation, laboratory confirmation using established transport systems, control activities if necessary (vaccination), and dissemination of information to the national level and back to the local level. These activities ideally occur within 48 hours of the identification of a case. HMIS, on the other hand, is a passive system of reporting

information from health care facilities that is primarily used for monitoring, policy-making, planning, and evaluation. An effective health care system requires both surveillance and HMIS. Although many disease prevention and control activities are population-based and take place outside the health care services, there are also many promotive and preventive activities that occur within good quality services (e.g., child immunization, TB treatment), and coordination between the two systems is ideal. Nevertheless, countries with an effective public health surveillance system have a surveillance structure and reporting process that is separate from HMIS.

BOX 3. Some differences between Communicable Disease Surveillance and HMIS

Surveillance	HMIS
Primary objective is disease prevention and control.	Primary objective is good quality health care services.
Reporting often active (active search for cases) depending on disease and context (e.g., epidemic).	Reporting is passive – e.g., cases reported from health care settings.
Reporting frequency depends on disease – may be immediate, usually weekly.	Reporting is usually monthly – though unusual events may generate more rapid reporting.
Individual case information reported (except large epidemics where cumulative numbers are used).	Cumulative numbers reported.
Sources of information include all types of health facilities, community-based information, newspapers and rumors.	Sources of information include all types of health facilities, may include community-based sources, but not newspapers and rumors.
Cases usually investigated (household contacts, laboratory info as appropriate, etc.).	Case investigation not routine part of reporting.
Linkage to laboratory network is important.	Limited linkage to laboratory network.
Data analyzed and interpreted periodically – frequency depends; can be daily during epidemic.	Data analyzed and interpreted periodically – monthly, quarterly or annually.
Response to information often immediate to prevent and control outbreaks, disease occurrence.	Response to information is routine – resource management, policy-making, planning to improve health care services.
Data used to monitor disease trends and adequacy of disease prevention and control programs.	Data used to monitor disease trends and adequacy and quality of health care services (that include disease prevention and control activities).

1.3.8 Overview of Information Systems and Need for Integration

Pakistan has several information systems that function with varying degrees of success as surveillance systems. Information systems are present in most FLCFs, so a culture of systematic and continuous data reporting exists. However, the systems vary from place-to-place and level-to-level (district, provincial) in form, function, data collection and recording methods, and are not integrated. Currently, these systems are highly fragmented and often vertical, leading to duplication of efforts in some cases and unbalanced resource distribution in others. Despite these problems, these structures can be used to form the basis for a public health surveillance system. Greater integration and resource sharing, particularly at the district level, is needed to increase efficiency and effectiveness. All of these systems would also benefit from a more integrated vision of disease prevention and control at the provincial and federal level.

1.4 Assessment of Surveillance at Each Administrative and Facility Level

1.4.1 National Level

Each of the surveillance systems summarized above reports to separate units/programs in different agencies. Some systems are housed within the NIH (an autonomous agency) while others are part of the MOH. None of the systems seems to communicate effectively with the others even when they are dealing with the same diseases (e.g., AFP, DEWS, HMIS all gather data on neonatal tetanus). Responsibilities at the national level in other countries include: policy development, monitoring, and supervision. Each of the systems has different degrees of supervision e.g., the AFP system has a supervision plan and evaluates each province annually, while other systems carry out few supervisory activities. Several, but not all of the systems publish annual reports summarizing their findings and making policy recommendations. Degrees of dissemination and feedback with provincial and district levels also vary as do the use of information for policy development.

1.4.2 Provincial Level

The process of devolution has contributed to increasing confusion about responsibilities for surveillance and response activities, particularly at the provincial and district levels. However, provinces provide considerable leadership and the team was impressed with the management and organizational skills generally found at this level. As noted previously, surveillance responsibilities at each level have not been clearly defined. For some of the systems, provinces seem to be nothing more than a conduit for information up and down the chain. Nevertheless, there were also several interesting experiments being carried out to improve provincial level capacity to respond to surveillance information. These included provincial epidemic cells and outbreak investigations that included public health recommendations to prevent future outbreaks (see Box 4).

BOX 4. Epidemic cell in Balochistan

The department of health in Balochistan province established an epidemic cell consisting of three key people including the epidemiologist and HMIS coordinator. They are recognized as the people to contact if an outbreak is suspected. The cell has developed a system to improve identification of epidemics and to respond more effectively when one occurs. This cell has responded to several outbreaks including cholera and CCHF. The cholera outbreak was carefully investigated and resulted in the documentation of V. Cholera in stools, a detailed map of cases, a low lethality rate (0.5%) and the development of recommendations to prevent outbreaks in the future. Likewise a plan has been developed to identify and to respond quickly to cases of CCHF. This worked well during the last outbreak which contributed to very low mortality and a small number of cases.

1.4.3 District Level

The recently begun process of devolution has increased responsibilities and opportunities at the district level. The team was able to visit only 4 districts, so the sample is very small. However, the districts visited had well-organized health teams that were familiar with health information from their districts and with recent outbreaks. One of the districts has developed a "health scrutinizing committee" to monitor information more systematically, to identify important trends and unusual deviations, and to provide information for effective and timely decision-making. It was clear during these visits that AFP/polio was the number one priority. However, there were

concerns expressed about several other communicable diseases including cholera, hepatitis, typhoid, and vaccine-preventable diseases other than polio. There was a great deal of interest and enthusiasm for strengthening the surveillance system and improving worker capacity. In some cases, resources (e.g., computers) that had been provided for one surveillance system were being shared with other priority disease areas. Supervision of local health facilities was considered a responsibility of the districts and in some cases transportation was also shared among programs. Supervision was sporadically carried out by a team of district health workers to increase efficiency. Most districts utilize some mechanism for learning about and investigating rumors and diseases reported in the media.

1.4.4 First Level Care Facilities

Staff interviewed at primary health care facilities (primarily the leadership) was all knowledgeable about the importance of reporting AFP cases and worked with LHW to identify cases in the community. However, other surveillance systems did not run as smoothly. As noted earlier, in most (if not all) cases the DEWS system was not operational. While the posters for charting weekly tallies of cases were posted on the walls, little effort was evident that they were being filled in or utilized to identify potential outbreaks. Staff seemed familiar with HMIS and most filled out HMIS forms. However, information was not utilized for planning or disease control activities. LHW provide information from their assigned communities. However, LHW information is not consolidated with the HMIS information and the two are sent onward via different channels. While there seemed to be no systematic way of monitoring diseases, staff did respond and investigate suspected outbreaks in some cases. In one case, a diarrhea outbreak was noted and the medical officer in charge took the initiative to visit the affected village and do a rudimentary investigation.

1.4.5 Hospitals

There is no standardized national reporting system for hospitals in Pakistan, which is a major system gap. Staff in public and many private hospitals have been trained and are involved in AFP surveillance. However, in the few hospitals we visited, staff are not involved in reporting communicable diseases to any other source except when and if specific requests are made. The staff of one of the hospitals we visited (Rawalpindi) was developing its own computerized information system to improve planning and to better manage their resources. Private sector respondents expressed variable interest regarding participation in a national surveillance system, and most indicated resources would have to be provided for them to take part. The military manages a well-established, good quality health care system for its staff and dependents across Pakistan, including secondary and tertiary care hospitals. In addition, the general population, although not entitled, also use the military services as private patients. However, there is no disease reporting from this extensive system except for polio.

1.4.6 Communication and Feedback Between Levels

The AFP/polio surveillance system has well-defined roles, responsibilities and channels for communication between the different levels and facilities of the health care system. TB also seems to have good communication between levels. However, for other surveillance systems communication is a major problem. An example of the lack of adequate interaction is presented in Box 5. In this case, a major issue was the timeliness of the response – communication occurred but not in a timeframe conducive to controlling an outbreak. On the other hand, as noted previously, some provinces have established systems to improve identification of outbreaks and the timeliness of communications. In addition, the health teams at the district and provincial

levels expressed great interest in improving surveillance systems, including coordination between levels for diseases other than AFP/surveillance.

BOX 5. Meningitis outbreak detected, but led to limited response

An increase in the number of meningitis cases was reported by one of the districts through routine HMIS channels. The increase was duly detected at the provincial level. Because information flow is slow, the outbreak was not noted until a couple of months later. A letter was sent to the district advising them that a possible outbreak had been detected. However, there was no other follow-up to assure that control measures were being undertaken and the outbreak was being contained. There was also no communication with other districts advising them that there was a meningitis outbreak. In fact, another district also reported what appeared to be an increased number of cases, yet there was no response. While it is salutatory that an outbreak was identified, and this is a first step in an adequate surveillance system, there are two major issues raised from this experience: (1) the lack of timely reporting for diseases with potential public health consequences, and (2) the lack of adequate response. A third issue is the absence of a laboratory diagnosis of causative organism.

1.5 Legal Framework

One of the causes of confusion about surveillance in Pakistan is the lack of a legal framework defining the government's role in protecting the public's health. Such a law would clearly delineate the government's responsibilities to monitor diseases that threaten the public's health and would be a basis for public health surveillance. A legal framework is required to define roles and responsibilities at each administrative level; it also forms the basis of a smoothly running system. A legal framework is also required to define the responsibilities of individual health workers and health facilities that are the primary sources of information, including those in the private sector. In addition, a legal framework is necessary to balance and define the rights of individuals to privacy and confidentiality versus the public's right to protection from diseases. It should define the state's responsibilities and limitations during public health emergencies.

1.5.1 Mandatory Disease Notification

In order to identify and contain public health threats at an early stage, most countries have a system of mandatory disease notification. A legal framework is necessary to provide a basis for obligating providers and facilities to notify public health officials of the occurrence of certain diseases. The diseases that would require notification vary from country to country and depend on public health priorities. A prioritization exercise is one way for Pakistan to define which diseases most urgently require a prevention and control system; those disease should be reportable. It is important to begin with a few diseases and develop an effective surveillance system (as has been done with AFO/polio) instead of trying to tackle too many diseases at once.

1.6 Information/Communication Infrastructure

A modern communicable disease surveillance system includes capabilities for rapid transmission of information and communication, particularly in the case of public health emergencies. Control of outbreaks and epidemics requires a prompt response with the application of appropriate interventions. Computer technology does not replace the importance of human capacity e.g., the ability to identify cases, which is fundamental for an effective surveillance system. Nevertheless, it can enhance human capacity by permitting the rapid analysis of data, the identification of trends, and automatic report generation, including identification of abnormal events and trends. Information technology permits rapid linkages and networking across regions.

Pakistan is developing a computerized health information network. Electronic information is generated at the district (and sometimes sub-district) level and sent to provinces either via E-mail or diskettes. Some of the FLCFs visited were entering information – particularly HMIS – in computers. Information for surveillance can be incorporated within this nascent network. However, several issues will need to be addressed. Data standards are necessary, as well as a consistent methodology from place-to-place. Timeliness is very important for outbreak/epidemic control. The success of the AFP/polio surveillance system has shown that timely information can be obtained in Pakistan through support for training and placement of adequate staff for response, supervision and supervisory training. A web-based system would further improve the consistency and timeliness of data transmission and permit greater transparency and sharing of information. However, privacy and confidentiality issues have to be addressed as the surveillance system develops and expands. Maintenance and continued development of information systems is also an important issue.

1.7 Assessment of Training Needs

A well functioning surveillance and public health system is dependent on the availability of skilled workers well versed and experienced in applying the knowledge of various public health disciplines that are required to conduct their duties. Practical, job related training is needed for health workers to develop and to maintain these competencies at all administrative levels with frequent refresher courses. Devolution to the district level has created an enormous need to improve public health management capacity. The existing training programs will need to be strengthened by introducing training in critical areas like applied epidemiology at the national, provincial and district levels, laboratory training, training in communication and informatics, and evidence-based public health management. Without strong capacity in the area of epidemiology (the central discipline associated with the ability to collect, analyze, interpret, and act on surveillance information), developing countries will not be able to build and use surveillance systems that serve their broad array of needs, and they will remain highly vulnerable to the threats of emerging and reemerging infectious diseases. They will also remain highly dependent on external assistance and unable to set and execute their own health priorities.

1.7.1 Training Resources Currently Available in Public and Private Sector

Public Sector: Federal Level. The objective of the MOH's National Health Services Academy (HSA) in Islamabad is mainly to develop human resources and build capacity of public sector staff in public health disciplines. To this end, the Academy conducts Masters in Public Health (MPH) courses. Trainees are recruited based on merit through a series of tests and by a quota system. The HSA has established institutional collaborations with local public health institutions and collaborates with various development partners. The challenges are a weak faculty (both in terms of numbers and quality) and a very weak field component, although the dean of the Academy is open to new ideas including projects/rotations of MPH students through the MOH/DOH. The frequent staff rotation (including the deans) is a challenge.

The College of Physicians and Surgeons of Pakistan (CPSP) is an accrediting institution for post-medical specialties in Pakistan. Its certification is coveted by physicians in the public and private sectors and it would be a potentially attractive partner for an FELTP. However, CPSP has strictly clinical and didactic curriculum requirements and sets a pre-defined percentage for awarding certificates for every cohort, regardless of performance.

Provincial Level: The Institute of Public Health (**IPH**) in Lahore is a comprehensive public health training institute which offers several Masters level courses, including a MPH, with a 50%

field component. The institute invites and accepts trainees from all over the country. Eighty percent of health planning and policy posts in the provinces are filled by graduates of IPH. There is a permanent faculty of 40, plus invited faculty. It also responds to the Punjab's DOH's requests for assistance in outbreak response by providing epidemiologists on the team. The institute has no budget for research and development but has successfully bid for research grants from development partners. It collaborates with local public health institutions and with the John Hopkins University. The IPH in Balochistan undertakes management courses and has been involved in reorganization of the health sector. However, it does not have an epidemiologist and does not offer MPH classes.

Community Medicine Departments of two medical colleges. Fatima Jinnah Medical College in Lahore and the Ayub Medical Complex in Abbottabad were also visited. There is minimal rotation of students (4th year) through the health directorates. In Abbottabad, there is a 10-day field rotation but the teaching method is through observation only, with no mentored, hands-on training of basic public health functions. The above institutions and other medical colleges use community medicine curriculum which have minimal links to public health issues relevant in Pakistan. For example, the current physicians' practice of recording disease diagnosis at public and private facilities varies greatly according to the physician's subjective and clinical experiences. None of the physicians in the institutes visited by this team were using case definitions developed by DEWS for disease diagnosis. This directly affects the quality and validity of surveillance data.

PHDC/DHDC Network: The World Bank/DFID[9] established a network of training-*cum*-management development centers through the Family Health Projects. The network consists of the Provincial Health Development Centers (PHDCs) and the District Health Development Centers (DHDCs). The function of the centers was to assess public health training needs, develop training materials and master trainers, conduct training and operational research, and direct management and organizational development. The capacity and functioning of the institutions varies across provinces. Since devolution, the linkage between PHDC and DHDC appears to have been severed and DHDCs now function somewhat independently of the PHDCs.

In Punjab, the physical/structural network of training exists but is outside the mainstream public health programs as most programs conduct their own training. The PHDC conducts short courses on management, some courses on applied epidemiology, and provides orientation for new medical officers entering public service. The Sindh PHDC is less active than in Punjab and contributes to the in-service training of public sector health workers. However, the PHDC only conducts training when programs request them to run courses due to lack of resources in its budget for training. Besides training it the PHDS also participated in baseline surveys of the Women Health project. In Balochistan, the PHDC is not as active as the one in NWFP but there are plans to merge it with the IPH there. In NWFP, the PHDC has been converted into a provincial academy for health and is now termed PHSA, offering MPH courses. PHSA and 4 Divisional Health Development Centers are under the Secretary Health and not the Directorate and linkages exist with all provincial public health training institutes except the medical colleges. PHSA offers much better training services and funding and runs short courses including laboratory training, training in hospital management and computer proficiency for Afghan workers and forecasts a growing need for training in Afghanistan in the future. There are residential facilities with each PHDC and DHDC. Except for NWFP, all districts in three

[9] All the PHDC/PHSA networks were developed by the World Bank under the Family Health Project in the mid 1990's with the object of identifying pubic health training needs for MCH programs in the country, providing training, and monitoring and assessing the training delivery.

provinces have DHDC with varying levels of functionality. Most DHDC premises are being used for training by other programs.

Private Sector: The Aga Khan University (AKU) is a private university with a very strong Community Health Sciences Department, which has collaborated with international health agencies like the CDC. AKU is a quality training institute with a good field component. Graduates of AKU work in key public health positions in Pakistan and other countries. Besides Aga Khan University there are other private universities that can provide formal training courses in public health including Ziauddin University and Baqai University in Karachi.

No consideration currently is being given to evaluating training (except at Aga Khan University) or to follow up and placement of graduates after training. If capacity building is the goal, evaluation and follow up are of paramount importance. Epidemiologists and other health workers who graduate from these institutions need to be posted in the ministry or departments that are appropriate for their learned competencies.

1.7.2 Human Resources for Surveillance and Epidemiological Response Capacity

Epidemiologist posts exist (at basic pay scale 18) in every district in Sindh, although most of these posts are either filled by non-epidemiologists or are vacant. Other provinces do not have any epidemiologist posts even though all district offices visited expressed a great need for epidemiologists to analyze and interpret disease data generated by HMIS and other surveillance programs. There are surveillance officer posts at the provincial and district levels in all provinces but most are funded by the WHO and are used exclusively for AFP surveillance. There are some MREO posts in Punjab and Sindh and fewer still in NWFP though Punjab is planning to re-establish MREOs in all districts. **There is no epidemiologist or an epidemiology or surveillance focal unit in the MOH at the central level.** However, there are epidemiologist posts in the preventive programs e.g., HIV/AIDS and malaria control programs. Under the NHIRC there are plans to establish a surveillance unit. If established, it should be staffed with epidemiologists, informatics specialist, communications expert and a laboratory scientist for proper functioning.

1.7.3 Conclusions

Public health training is an integral part of disease surveillance. The implementation of a surveillance system occurs through a competent and motivated workforce that has knowledge of what is expected of them and up to date competencies to deliver it. In Pakistan the public health training institutes show great variability in quality. The physical network reflects a considerable resource investment and could be linked functionally with surveillance and control programs, and with in-service, mentored training that is focused on analyzing and applying existing disease information at all administrative levels. There are several opportunities for cross-training of health workers. Where introductory courses currently are being conducted for various health workers, they could potentially also be trained on surveillance standards and methods.

At present, IPH is the preeminent institute and could take the lead in addressing a training plan for surveillance. HSA should participate in preparing the training plan. HSA needs to be strengthened and eventually should be placed in charge of developing a national public health training network with the institutes mentioned above. IPH and its partners will need to assess national public health training needs and to develop standards, methods, and tools, as well as evaluation plans to assess the impact of training at all levels. Initially, training should be implemented in no more than two provinces and the federal area, and then be expanded to other parts of the country.

In the long term medical college and nursing curricula will need to be revised to include training on priority diseases and realistic public health issues in Pakistan. Surveillance is directly dependant on the expertise of graduates from these institutes.

The AFP surveillance system has trained and put in place a group of high-performing AFP surveillance officers. The experience of this cadre of public health surveillance professionals should be capitalized upon. They should also receive additional training in the surveillance of other priority diseases (to be defined by the GOP). They could potentially be posted as surveillance officers in the district and provincial surveillance units.

Major areas for training which need to be introduced include:

- Applied epidemiology (with basic biostatistics and informatics)
- Evidence-based public health management
- Surveillance (establishing, evaluating systems, threshold analyses)
- Laboratory training
- Outbreak detection and response
- Emergency preparedness and disaster management
- Monitoring and evaluation
- Priority diseases

1.8 Laboratory Assessment

1.8.1 Background

All disease surveillance systems rely at some point on the availability of accurate and reliable laboratory data. An important function of laboratories is to confirm the presence or absence of a disease. While clinical criteria can be used when laboratories are unavailable, a laboratory confirmation increases diagnostic reliability and therefore improves the specificity and sensitivity of the surveillance system. Laboratories can also confirm the chain of transmission for some diseases. Laboratories capable of producing quality results (results in which there is high confidence of being correct) are therefore critical to the success of communicable disease surveillance and control programs. In addition to establishing accurate baseline information about the occurrence of disease, laboratory data are essential for focused surveillance activities and for monitoring the success or failure of program activity. An organized network of public health laboratories, with links to surveillance and disease control programs, is an essential feature of public health surveillance. The full report of the laboratory assessment, including methods used, is presented in Annex 2.

1.8.2 Assessment Observations

As a result of our observations, we categorized general observations into strengths and weaknesses of laboratories. Because this assessment was focused on communicable disease, we then proposed recommendations that would establish a framework for a national system of laboratories. The focus and driving need for the establishment of the network is to provide laboratory results in which communicable disease surveillance programs are confident. An outcome of this broad approach to strengthening laboratories is that any testing that is subsequently implemented using this approach would also result in high quality results in which patients, health care providers, and program managers could have confidence.

1.8.3 Strengths

- Laboratory staff is trained and there are usually sufficient in number.
- Reagents and supplies generally available.
- From most interviewed, there appears to be an interest in participating in disease surveillance.
- There are a wide range of laboratory capacities and capabilities.
- Facilities are generally sufficient in size although housekeeping could be improved in most.
- There is one professional organization (Pakistan Association of Pathologists) that could serve as a focal point for improving quality of testing in the country.
- There are examples where laboratorians are included in epidemic investigations.

1.8.4 Weaknesses

- There is no focal point at the national or provincial level for laboratory issues where leadership can be provided to establish and maintain a network.
- There are no national, provincial, or district laws/regulations addressing laboratory practice, safety or waste disposal.
- There are few laboratories where the concept of a quality systems approach is understood. Without documentation of adequate controls for the analytes/agents being tested, without documentation that the laboratory has tested human samples for the analyte/agent of concern, there is no way of assuring that results are correct.
- There are no organizations, other than the Pakistan Association of Pathologists, where communication and exchange of information can take place.
- Laboratory safety and medical waste disposal procedures are lacking.
- There is a lack of availability of confirmatory tests/reference testing.

The data collected and reflected in Annex 2 supports the statements listed above. Overall, physical facilities were adequate, electricity, water services and phones were available. Conversely, housekeeping (general cleanliness) was lacking, electricity could be sporadic and other than in large facilities, backup generators or uninterruptible power supplies (UPS) were not available. The majority of facilities had no access to internet.

One of the major problems is a general lack of documentation. So, for example, if an assessor was told that there is standard use of hypchlorite and there is no written procedure for making the appropriate strength solution anywhere in the laboratory, then there is no proof that disinfection takes place. Similarly, there were most often no written procedure manuals.

Another major issue that will have to be addressed if surveillance for infectious diseases is to be established is the capability of laboratories to perform any microbiological procedures. While automated methods for chemistry and hematology have been implemented, microbiological culture and identification methods require a much higher level of academic training because there is much more judgment involved in providing a final test result. This issue alone will require a concerted effort on the part of multiple partners in Pakistan before a system that effectively supports surveillance can be established. There are private and governmental laboratories (very few, but sufficient) that could provide country-wide service. Attempts to implement methods for culture and identification at a local level are costly, require significant human resources, and are exceptionally difficult to maintain quality. Alternately, a regional system of existing laboratories

along with adequate courier services could assure almost country-wide support of surveillance. Such a system could be developed in a public/private consortium.

While there is much work to be done to establish an appropriate laboratory infrastructure to support surveillance, the laboratorians we spoke with were clearly interested in participating and improving the quality of services they provide. Development of that infrastructure will require resources to assure adequate facilities, to assure adequately trained personnel who are kept updated on laboratory methods, to provide adequate quality assurance of testing, to develop mechanisms that allow timely reporting (e.g., access to the Internet and electronic reporting), and finally, to assure clinicians are appropriately trained on the proper use of laboratory resources.

1.9 Conclusions: Strengths and Gaps

1.9.1 Strengths

There is considerable interest, enthusiasm and willingness at all levels to improve surveillance, disease prevention and control, and outbreak response. The degree of interest, enthusiasm and openness to discussing and improving the surveillance system was apparent and impressive at all levels: federal, provincial and district. In part, the success of the AFP/polio surveillance system has made health staff aware of the impact that good surveillance can have when tied to effective public health interventions. It seems to have ignited considerable interest in doing more to detect, prevent and control other communicable diseases. The momentum that polio's success has created provides a unique opportunity that needs to be taken advantage of to improve the surveillance system.

The AFP/Polio surveillance system is top-notch and works at every level from grass roots to federal. The AFP/polio surveillance system can be considered a gold standard that works from the community level to the FLCF to the district, hospital, province etc. The system has been key in reducing polio transmission with only four cases in the first quarter of 2005. It is likely that polio transmission will be interrupted this year. The system has potential for expansion. In fact, detection and reporting of cases of measles and neonatal tetanus has already been incorporated in several parts of the country even though activities to investigate cases and prevent and control those diseases have not been systematically implemented on a national basis.

Structures are in place that could be tapped to improve surveillance. Several types of structures were noted that could serve as a foundation on which to build improved surveillance. Information systems function in many FLCFs, so a process of systematic and continuous data collection and reporting exists. There are several vertical information systems that are working with variable degrees of success (e.g., TB, malaria, HIV/AIDS, AFP, EPI, and HMIS). These structures can be integrated into a more comprehensive public health surveillance system. There are provincial and district training centers (Provincial and District Health Development Centers) that could be strengthened and utilized for training in epidemiology and public health, and more specifically surveillance and response.

The LHW program is strong with potential that could be harnessed for community-based surveillance. Links to the community are important for effective surveillance. The LHW program has been successfully included as the basis for community surveillance of AFP. LHW are trained to identify and report AFP cases immediately. An LHW information system includes aggregate reporting of some illnesses. Reporting could potentially be expanded to other diseases and the detection of outbreaks. However, care must be taken not to overload the work of LHW who have very specific priorities in provision of MCH/FP services.

There are pockets of good practice in various aspects of surveillance. There are sporadic pockets of good practice in surveillance. Lessons learned from these experiences should be documented, shared across districts and provinces, and the more successful experiences systematically incorporated as part of surveillance. Examples include: well done outbreak investigations with written reports summarizing findings and public health recommendations to prevent future outbreaks; an 'information scrutinizing committee' in one district that reviews information from all systems on a monthly basis to improve planning and decision-making; an epidemic cell in one province composed of key health staff with necessary skills, that has responded quickly to several outbreaks; and pockets of good lab capacity with well-trained staff and availability of necessary supplies.

1.9.2 Strategic Gaps/Needs

Strategic gaps and needs were identified that have to be addressed for a truly comprehensive and effective national surveillance system to be developed.

A single unit or body responsible for public health surveillance and disease prevention and control activities at each administrative level. While sporadic coordination among the vertical systems exists in some districts and provinces, these systems are more often isolated from the others with each program responsible for monitoring its own disease or activity. There is confusion about the distinction between an information system and a surveillance system with a general misperception that information is surveillance. There are limited, disease specific guidelines and operating procedures for surveillance and outbreaks, but none are comprehensive. A single unit is required to bring together surveillance activities to function effectively as a network including information systems, programs, laboratories, and response activities. With the exception of the AFP/polio surveillance system there is very limited response to individual case reports or disease clusters.

Well defined roles and responsibilities for each administrative level. The mission noted a lack of clarity about the roles and responsibilities of the district and provincial authorities for surveillance, disease prevention and control, and outbreak response activities. These roles and responsibilities must be defined in order for the system to function effectively and efficiently. Capacity-building is also necessary to assure that responsibilities are carried out will.

Legal framework. Disease reporting involves resolving the contradiction between protecting a patient's confidentiality on the one hand and the public's right to protection from preventable epidemics on the other. A legal framework is required to resolve this contradiction. It should clearly delineate mandatory reporting for key priority diseases (and permit periodic updating). A legal framework should also define responsibilities to prevent and control diseases at the different administrative levels, as well as regulate laboratory practice and assure quality of laboratory reporting.

Increased resource sharing among programs. Some of the vertical programs have an abundance of development partners to provide resources while others have very limited resources. Activities such as supervision, digitalization and analysis of data, could be more efficiently and effectively carried out if resources (human resources, vehicles, computers) are shared. Some sharing of resources at the district level was noted and this should be systematized for all disease surveillance and control programs.

Functional public health laboratory network. A public health laboratory network that involves all administrative levels that can detect and confirm diseases and assure the quality of laboratory results is essential for a well-functioning surveillance system. In Pakistan there is no public health laboratory network and there is no focal point to take the lead for establishing and maintaining such a network. There are, however, clinical laboratories at provincial and district levels that could form the basis for a public health laboratory network linked with the Public Health Division of Laboratories at NIH. There are also no laws regulating laboratory practice, bio-safety, or waste disposal. A quality systems approach is generally not available and quality cannot be ensured and measured.

Transition AFP/polio surveillance system into the health system's mainstream. As noted above, the AFP/polio surveillance system is a model surveillance system and a foundation on which to build further surveillance activities. However, it is also a system with considerable resources from the WHO related to the international drive to eradicate polio. It is questionable whether the system as it currently exists could be sustained. A realistic plan is needed so that AFP surveillance is fully absorbed by the Ministry and Provincial/District Departments of Health thus assuring its sustainability.

Sustainable financing. Most of the programs that include effective surveillance activities are supported by development partners. There is a need to assure financing preferably by including a line in the budget specifically for surveillance.

Data analysis and conversion into useful information that leads to timely action. While there is considerable collection of data at the FLCFs with aggregation of this data at the district and provincial levels, there is very little analysis of the data and translation into information that is used for decision-making to improve the people's health. HMIS data is used to write reports at the national level and in some provinces; however these are published months or years later and cannot contribute to the timely use of information to prevent or control outbreaks. For effective surveillance and response, diseases must be reported more frequently than monthly, and as is currently the case for AFP, some diseases must be reported immediately. Ideally surveillance information should be analyzed at the district level in order for timely actions to be initiated. However, this will need technical guidance, and support and training from federal and provincial surveillance units.

Systematic mechanism for outbreak recognition, investigation, and intervention. Despite the attempt to create the Disease Early Warning System, this system is still not operational and there is no systematic mechanism for outbreak recognition, investigation, and response. As noted under strengths, there are some pockets of activity with DEWS and it would be important to learn from those experiences. However, such mechanisms should be developed for all districts and provinces and be part of the public health surveillance system rather than a stand alone unit in NIH.

Harness information technology and informatics. Incipient steps have been taken to computerize information systems, particularly at the provincial level. Some provinces have rapid reporting capabilities and are reporting via E-mail. However, most districts and some provinces are still reporting via mail. Harnessing information technology could improve the efficiency and timeliness of disease reporting and response. Automated analyses at the district level could provide easier access to useful information for decision makers and response systems.

Systematic approach to training. Training and capacity building is a key issue for the development of public health surveillance in Pakistan that cuts across most of the issues raised

above. Epidemiology is the central discipline associated with the ability to collect, analyze, interpret, and act on surveillance information. There is a great need for Pakistan to train its own epidemiologists to minimize expatriate dependency in this critical discipline. This can be addressed through programs like the FELTP. Similarly, devolution has given the districts increased responsibility for public health decision-making and this has created an enormous need to improve public health management capacity at this level. Data for Decision-Making (DDM) program or other, evidence-based public health management modules can address this issue. In the case of the surveillance system, there is a need to develop health workers' capacity to collect and analyze data, investigate cases, initiate appropriate public health interventions for disease prevention and control, and communicate with the public, media, policy-makers and politicians among others. Some of the major gaps identified in training include applied epidemiology (to translate field information into public health interventions), informatics training and laboratory training.

Involvement of hospitals, private, academic sector, other stakeholders. With the exception of the AFP surveillance system which has incorporated virtually every strategic sector in its reporting and investigation system, the other surveillance systems have significant gaps. Communicable diseases identified among in-patient hospital admissions are not generally included in the other surveillance systems. This is a significant gap given that those who are sickest will often be first identified by hospital workers. This gap will need to be corrected for an effective surveillance system to be developed. The private sector accounts for 70% of health care delivery in Pakistan and yet it is not involved in reporting diseases with the exception of AFP. Correcting this situation will require a legal framework (see below). The academic sector is important for training and capacity building beginning with medical students and other personnel and continuing on to in-service and post-graduate training.

Preparedness for epidemics and disasters. The lessons of epidemics such as cholera, SARS and CCHF include the importance of preparedness for more effective response, control and management. While there are some activities in Pakistan to develop preparedness for disasters, these have not been translated into written plans at the provincial and district levels that involve a multi-sectoral response.

1.10 Recommendations

1.10.1 Structure, Legal Framework, and Information Systems

Establish discrete surveillance units at federal, provincial and district levels that are responsible for coordinating all surveillance activities including disease detection and response. These units should be distinct from HMIS. Such a single, clearly identified focal point at each administrative level is particularly important initially at the federal level in order to provide leadership and integrate existing fragmented programs into a unified, information-producing and response system. Currently, what few surveillance activities exist are distributed between groups in the MOH/DOH, national programs, and the NIH. The task of a national surveillance unit would be to develop national standards and case definitions, produce guidelines for how surveillance is to be conducted for specific diseases, receive disease reports from all programs for synthesis and analysis, coordinate response efforts and evaluate the impact of resulting actions. It should develop plans for bringing private and academic sector facilities into the surveillance system. This entity would also be responsible for making disease information available to policy-makers, providing feedback to submitters and other interested stakeholders, and function as the focal-point for international reporting required under the International Health Regulations. There should be corresponding units at the provincial and district levels with

crosscutting surveillance data analyses and use functions. These should be managed by trained field epidemiologists with clear position descriptions and training and experience requirements. These units should also have a laboratory coordinator identified at all levels to coordinate laboratory response in outbreaks and to integrate laboratory diagnostics into routine surveillance.

Develop a legal framework that mandates notification of priority diseases by all health sectors and clearly defines responsibilities of the administrative levels for disease prevention and control. While a legal framework will not by itself improve disease surveillance, it forms the basis for legitimacy of the effort by all stakeholders. A physician's ethical requirement to protect patients' privacy must be balanced by the public's right to protection from disease. To assure reporting from all sectors requires a legal mandate. Therefore the national action plan should spell out how this is to be accomplished. The roles and responsibilities of each administrative level and of health facilities must be defined in order for the system to function effectively.

Transition AFP/polio surveillance system into the health system's mainstream. The AFP/polio surveillance system is top-notch and should serve as the foundation on which to build effective communicable disease surveillance in Pakistan. It can be considered a gold standard that works from the community level to the FLCF, through all administrative levels, the laboratory and the private sector. The system has potential for expansion and tenuous efforts to expand and incorporate measles and neonatal tetanus surveillance have been made. However, it is also a very well resourced system supported by the WHO as part of the international drive to eradicate polio. It is questionable whether the system as it currently exists could be sustained. A realistic plan is needed so that AFP surveillance is fully absorbed and financed by the Ministry and Departments of Health thus assuring its sustainability and potential application to surveillance of additional diseases.

Surveillance and response activities must be functionally integrated across programs. The currently fragmented system creates inefficiencies and increases work loads at all levels but particularly at the district level. Expansion of current surveillance to other priority diseases would be difficult to sustain if individual structures are created for each disease. An integrated approach, with a common system for multiple diseases using similar structures, processes, and personnel, is much more efficient, less costly, and promotes a more effective use of resources. It permits the building of a surveillance system slowly and incorporating increasing numbers of diseases as resources allow. This is particularly important at the district level where the numbers of cases are smaller and resources are limited.

Increase resource sharing among programs. Some of the vertical programs have an abundance of donor provided resources while others have very limited resources. Activities such as supervision, digitalization and analysis of data, could be more efficiently and effectively carried out if resources (human resources, vehicles, computers) are shared. This is particularly true for the district level where activities such as supervision and use of computers are more efficiently done when all programs participate. Some sharing of resources at the district level was noted and this should be systematized for all disease surveillance and response programs. An integrated surveillance system would foster resource sharing.

Build health workers' capacity for improved surveillance, disease prevention/control, and outbreak response. A comprehensive analysis and plan is needed of the competencies and resulting training requirements for a communicable disease surveillance and response work force in the areas of applied epidemiology, surveillance, outbreak investigation and response, case investigation and management, the 21st century public health laboratory in disease monitoring

and outbreak response, public health informatics (including computer training), communications, and management and policy development. This analysis should include the need for, and utilization of, a field epidemiology and laboratory training program in Pakistan as well as the potential role of distance-based training. Appropriate training methods and institutes and certification requirements should be part of the workforce development plan. This plan should be linked at all administrative levels to career plans that assure utilization and retention of trained persons in appropriate positions and pay scales.

Elaborate a long-term plan to modernize the public health surveillance information and data transmission systems. A 21st century surveillance system must take advantage of 21st century informatics opportunities. The Pakistani disease surveillance system continues to be largely paper driven. The lack of access to informatics severely limits the system's timeliness and analytic capacity. Many sites have developed their own software package and thus they have no ability to communicate with each other electronically. Standardization, both for hardware and software packages, is necessary to transform the surveillance system to meet current needs. Privacy concerns will also need to be addressed. Relevant training and reporting formats and standards should be included in the informatics component of the plan.

Assure the use of surveillance information for public health interventions. Surveillance is different from ordinary information systems and involves the USE of information for timely ACTION to prevent and control diseases. This requires a public health surveillance workforce at all administrative levels that has adequate guidelines, is trained to analyze, interpret, and translate information into effective public health interventions, and is working closely with disease control programs and decision makers that will carry them out. No matter how well a surveillance system identifies and report diseases, unless these reports lead to appropriate actions, there will be no change in the public health status of the population.

1.10.2 Public Health Laboratory Network

Develop a national/provincial network of laboratories that incorporates private sector laboratories. A unit/cell in the NIH should be created and given the responsibility to oversee development of a national network of laboratories that communicates/collaborates with the surveillance system (e.g., assures availability of specimen collection kits). A position of national quality systems manager should be included in this unit/cell to develop the framework of a program that will assure quality of testing (e.g., access to proper control material, access to external quality assurance testing, access to equipment maintenance and repair services, serve as a focal point for laboratory training needs, etc.). Training will need to be provided for each of the proposed positions of National Laboratory Network Manager and National Quality Control Officer. The National Network Manager, with appropriate in-country staffing and with Technical Assistance, develops a plan of action for implementation.

Create a proposed regulatory framework for laboratory practice (to be conducted by National Laboratory coordinator). This would involve a review of existing laws/regulations from other countries; the development of an appropriate model for Pakistan; and an assessment of the potential impact of the proposed law/regulation

Develop a national quality systems program. A position of National Quality Systems Manager should be created and the person selected given appropriate training. Potential collaborators from the private sector (Shifa International Hospital, Shaukat Khanum Memorial Trust Hospital, Aga Khan University for training) and public sector (laboratories linked to teaching hospitals, Sindh

Institute of Urology or Armed Forces Institute of Pathology for external quality assurance programs / proficiency testing) will need to be determined.

Improve communications to public health programs and among laboratories (including private sector). Linkages with communicable disease program(s) are important to develop a working relationship for strengthening laboratory-based disease reporting. Development of a laboratory workforce would benefit from work with existing professional organization (PAP) to create a professional 'home' for laboratorians. The NIH should establish an annual national meeting of laboratorians to address issues of public health importance.

Create the availability of reference testing. Reference testing to monitor and confirm the accuracy of laboratory results should be developed; availability of appropriate equipment assured; technical training provided; and a referral system for confirmation of tests created (includes transportation of specimens).

1.10.3 Financing and Costs

Provide committed financing for public health surveillance: A functioning surveillance system requires commitment which will ensure sustainable financing. Surveillance is primarily a government function. The federal government should take a lead role in developing a financing plan for surveillance in close collaboration with the provincial governments. For five years initially, the federal government should finance the development and implementation of the system, with phased financing by the provincial and district governments, for activities to be undertaken at provincial and district level. The AFP/polio surveillance system costs approximately US 1.5 million annually. Further study is required to determine the costs of expanding this system, integrating it with other systems within a single surveillance unit, and making the investments necessary in informatics and laboratories etc. to permit a well-functioning public health surveillance system.

CHAPTER-2: VITAL REGISTRATION / VITAL STATISTICS / MCH SURVEILLANCE

2.1 Background and Methodology

Maternal and infant mortality rates are high in Pakistan compared to other countries in the region and countries with similar GDPs. The Government of Pakistan is a signatory to the MDG targets which include a three-quarter reduction in maternal mortality and a two-third reduction in infant mortality between 1990 and 2015. Therefore, improving maternal and child health is one of the MOH's highest priorities. Resources are being invested in programs that will contribute towards reaching these targets, including the LHW program, nutrition and immunization programs, and the Women's and Reproductive Health Projects. Accurate and timely statistics on basic demographic events (vital statistics) are a foundation of rational public health planning, policy making and programs, and the basis for monitoring progress in reducing infant and maternal mortality. Other methods, such as periodic surveys and sample vital registration systems can also be used. However, they generally do not provide information at the district level.

Maternal and child health surveillance implies the collection, analysis and use of information that is not just about births and deaths but includes ill health as well as process indicators that monitor access and quality of MCH services and thus contribute to a mother's and child's well-being, and prevent illness and death. The focus of this assessment is on collection and utilization of information about maternal and infant deaths and particularly the status of vital registration and statistics. However, it also addresses Pakistan's capacity to gather and use other indicators of maternal and infant well-being. In addition, it considers the potential for applying a sample registration and verbal autopsy methodology that can provide infant, maternal and adult mortality estimates at the national and provincial level, and for some sample districts.

The assessment was carried out through extensive consultations with leaders at the federal, provincial and district level; health staff working at all administrative levels on a variety of programs related to MCH; staff working on MCH in a variety of health facilities (FLCFs, hospitals); agencies outside the health sector who either work on vital registration or provide statistical information that is utilized by the Ministry of Health; and development partners providing assistance on information systems or in the field of MCH. Reports and records at all levels were reviewed to assess the current state of maternal and child health information systems. The objective is to provide a consensus-based report that can serve as the basis for the development of a National Action Plan to improve VR/VS as a foundation of maternal and child health surveillance.

Vital registration is defined as the continuous, universal, permanent and compulsory recording of the occurrence and characteristics of vital events.[10] Vital registration is generally essential to establish identity for civil rights such as school enrolment, issuance of a passport, voter registration, social entitlements, and so on.[11] It is recognized that vital registration addresses multiple needs of society including the use of the information on individuals at their birth and their death for health care policies.

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[10] United Nations. "Handbook on Training in Civil Registration and Vital Statistics Systems". Studies in Methods, Series F, 84. Department of Economic and Social Affaires. Statistics Division. United Nations. New York, 2002.

[11] United Nations. "Principles and Recommendations for a Vital Statistics System. Revision 2". Department of Economic and Social Affaires. Statistics Division. United Nations. New York, 2001.

In the case of fertility and natality as well as mortality, vital registration is a demographically, epidemiologically and medically superior source of information for both research purposes and to address immediate, operational health service provision issues related to interventions, day-to-day service, and other factors related to health strategy development for national and local health management. It provides benefits as a tool for monitoring the impact of changes in health programs and services on maternal and child survival. The timing of registered deaths could alert health systems to unusual concentrations of deaths, and a valid medical certification of cause of death allows good epidemiological follow-up. Vital statistics provide local information that surveys do not, and the information is timelier than that provided by most surveys. Its major limitations are coverage rates that tend to be low, particularly in poorer areas, and the quality of information obtained.

There are complementary sources of data for vital events. They include population census, surveys, continuous population registers, longitudinal studies, in-depth field work and participant observation of small populations, population "observatories", and the sample registration system. Sample registration prepared on a statistical basis is similar in all respects to national registration, except that it involves application of the conventional registration system to a limited area or areas of a country and therefore does not provide district or small administrative level estimates. Other practical aspects of such a system that could be implemented is the broad use of lay reporting of deaths, and reliance on verbal autopsy to obtain information on causes-of-death reporting for children under five and maternal mortality. India, China and Tanzania are each implementing SAVVY systems.

2.2 Vital registration in Pakistan

Data on births and deaths are collected by several complementary methods in Pakistan. There are different agencies involved in various types of birth and death reporting (registration, birth and death estimates, indicator estimates): population censuses, surveys, and administrative records (from the health and civil registration systems). We will first review the process of registering individual births and deaths – that is with a name, date and other standard information. We will then review other sources of information on vital events and maternal and infant mortality.

2.2.1 Union Councils

After the creation of Pakistan, births and deaths continued to be registered under various pre-1947 acts and rules. Since the mid-1960s the union councils in urban (Municipal Corporations, Municipal Committees and Town Committees) and rural areas are in charge of registering birth and deaths. The information collected on the birth and deaths certificates is not standardized. Urban birth certificates generally includes: name; date; sex; place of birth; parents' names and nationalities; father's religion and occupation; address; and name of person who attended the birth. Urban death certificates generally include: name; date; sex; age; place of death; cause of death; religion; and parents' names. Some urban areas have computerized this information. In rural areas, information is recorded in registers and the content is much more limited.

Information collected by union councils is not consolidated at the district level and there is no consolidated national, provincial or district report on births and deaths. Coverage of birth registration by union councils is not known but is generally considered very low (10%), particularly for rural areas. Information on birth certificates is not standardized and in no union council, urban area or health facility including hospitals that were visited was a birth certificate being used based on the WHO recommendations. This means that important health information related to the birth is not being captured at any level. Likewise, coverage of death registration is

also low – probably lower than for births – and the information on death certificates is also not standardized. Quality of information on cause of death is poor – with the cause often listed only as "illness". ICD coding is not used.

BOX 6. National Database and Registration Authority (NADRA)/ Birth and death registration pilot in Punjab

NADRA was created in 2000 as a government entity with the objective of registering every citizen and her/his family. Citizen registration actually began in 1973 but between then and 2000 only 7 million people were registered. Within the space of three years NADRA increased the total to 68 million people: 42 million adults and their children, and the number is increasing by 30-35,000 daily. NADRA recruited an array of skilled, dynamic personnel to establish a system that uses state of the art technology with interactive data entry including full biometrics (digitized photo, fingerprints) that is one of the fastest in the world. Registration occurs in 225 on-line/web based enrollment stations and 101 fully computerized mobile units to increase access in rural areas. The process is totally paperless. The citizen receives her/his National ID card once information is verified (approximately 15 days).

NADRA has developed software for a computerized birth and death registration system that is linked with the national database. This will clearly facilitate citizen registration in the future. By law, birth and death registration is carried out at the local level by union councils. NADRA began piloting its birth registration system in 2004 in 167 union councils in Punjab and provided considerable technical assistance to assure that computer literacy is improved and adequate for the task. So far the process has been successful. During the period of the pilot, 69,000 births were registered in 2 districts in Lahore. NADRA believes the coverage is 99.9%. An IEC campaign was launched including announcements in village mosques to encourage people to register births. NADRA is also tackling death registration in the pilot area. This was delayed by the need to number grave sites. It is expected that the entire country will replicate this system over the next several years. A pilot in NWFP is being launched, and Sindh and Balochistan are expected to follow.

NADRA was provided government funding during its first years of functioning. However, it is expected to become auto-financing. Birth registration is now required for a child to enter school. Registration is free of charge if carried out within 60 days of birth. However, after 60 days there is a progressively increasing penalty. While birth registration is free, if the family wishes to obtain a computerized birth certificate the charge is 100 rupees. This provides an incentive to union councils to increase registration coverage. Thirty percent of money obtained by union councils goes to NADRA to recover costs and finance maintenance and supervision.

NADRA executives are very interested in increasing utilization of their data bases by other ministries. The need for cost recovery provides an incentive to increase cross-sectoral data utilization. NADRA is open to the idea of incorporating data required by other ministries. For instance, it is working with the MOH which requested that information on disabilities be included in the database so that an 'invalid' designation is included in the ID card.

2.2.2 National Database and Registration Authority (NADRA)

The National Registration System was introduced in the country during 1973 when the Directorate General of Registration was established under the National Registration Act.[12] NADRA was created in 2000 to accelerate general registration (see Box 6) and is responsible for issuing a national identity card to all citizens once they turn 18. It has a state of the art computerized system for maintaining a national database and issuing ID cards. The data base record includes socioeconomic information, information on marital status and children, date of birth of the individual and his/her children, and disability information. When a citizen gets

[12] United Nations. "East and South Asian Workshop on Strategies for Accelerating the Improvement of Civil Registration and Vital Statistics Systems". Beijing, China. United Nations. Statistics Division. New York, 1994.

married or dies, NADRA is supposed to be informed about the event so the ID card can be updated with revised information or cancelled, respectively. The system has registered approximately 50% of the population over the past three years, and the goal is to register 80% in the next couple of years.

The box also explains the new birth and death registration system that NADRA is piloting in Punjab. The plan is to expand this system nationwide. The scope of the project is to develop a data entry and acquisition system for the issuance of a computerized birth registration certificate (CBRC) at union council level. Each CBRC contains a unique form number. The information registered in a national data warehouse could be used for multiple purposes, including vital statistics. In Lahore, the district DOH is involved in the process and has access to the computerized information.

At the national level the MOH has not been involved with NADRA as it develops this vital registration system. The birth information being captured does not include much of the standard information recommended by the WHO which could be very useful (see Box 5). Likewise no effort has been made to improve the cause of death information being captured so that it is useful to health planners.

2.2.3 Birth and Death Certificates

Standardized birth and death registration forms are not utilized in Pakistan. Each union council determines what information to collect. Most birth registration forms collect only demographic information. Some include the place of birth and who attended it. There is no information about the type of birth (e.g., Cesarean), the birth weight, APGAR scores, or complications during the birth. Such information is recommended by the WHO and would be very useful to health planners and policy-makers. Likewise death certificates do not collect standard information on the causes of death recommended by the WHO. The information being collected in the NADRA financed pilot in Lahore also does not utilize the WHO's recommended standards.

2.3 Other Sources of Data on Vital Events

2.3.1 Population Census

The population census is a potential source of birth and mortality data. It provides data on all geographic areas and for population subgroups defined in terms of census questions (e.g., occupation, educational level, migration status). Pakistan's last population census in 1998 included questions on the number of live births, the number of children still living as well as information about infant deaths during the previous year. These retrospective questions and indirect methods allow the calculation of fertility and infant mortality rates.[13]

The National Institute of Population Studies (NIPS) uses census data to make national projections on population and expected mortality. The current projections (1998-2023) include year to year population estimates by sex at the provincial level as well as provincial estimates for TFR, LE, growth rate, urban population, CBR and CDR. NIPS also produced and disseminated the Pakistan Population Data Sheet (2001), which includes fertility and population estimates at the district level for 2001, 2004, 2011 and 2021.

[13] United Nations. "Handbook on the Collection of Fertility and Mortality Data". Department of Economic and Social Affaires. Statistics Division. Studies in Methods. Series F, 92. United Nations. New York, 2004.

The NIPS projections could be used to assess the coverage of vital events registered and other types of birth and death reporting. Projections are available down to the district level. By comparing projections to the actual number registered, an estimate of coverage could be made for each district. Likewise the projections could be used to estimate coverage of births and deaths by LHWs. This could be an indicator of the quality of information being provided

2.3.2 Surveys

Household surveys are also a rich source of birth and mortality data. They do not provide the geographical detail or the information for small population groups that the population census provides, but they can provide more detailed questions on fertility and mortality and may be carried out more frequently than the population census.[14] The most important information available in the country for health policies related to births (fertility) and infant and maternal mortality comes from surveys conducted by different national and international agencies.

The FBS conducts the Pakistan Demographic Survey (PDS) every year and estimates demographic indicators (IMR; MMR; crude birth and death rates; general and total fertility rates; natural grow rate; life expectancy; sex and age specific mortality rates) at the national level for urban and rural areas. It also estimates IMR for urban and rural areas by sex and age (neonatal, post-neonatal); the percentage distribution of live births by type of attendant at birth and age of the mother; and percentage distribution of death by cause, sex and urban-rural residence.

The FBS has undertaken the Pakistan Integrated Household Survey (PIHS) every two years since the early 1990's and includes estimates of IMR by sex and region (urban and rural) and by mother's education at the national level. FBS is planning to undertake PIHS down to the district level using an updated version of the CWIQ survey to track intermediate health outcomes.

NIPS carried out a Pakistan Demographic and Health Survey (PDHS) in 1990-91; the Pakistan Fertility and Family Planning Survey in 1996-97; the Pakistan Reproductive Health and Family Planning Survey in 2000-2001; and the Survey on Women's Reproductive Health and Family Planning in 2002-2003. All these surveys offer information on births and deaths, and estimate fertility rates, child mortality rates (neonatal; post-neonatal; infant; and under five) for selected maternal characteristics (urban and rural area of residence, educational level, and maternity care).

UNICEF sponsored a national Multiple Indicator Cluster Survey (MICS) in 1995 and the same survey in 2002-2003 in all four provinces. The recent survey presents information for all districts on fertility and IMR. The provincial MICS is also likely to provide MMR for the three provinces of Punjab, Sindh, and NWFP.

The Maternal and Infant Mortality Survey (MIMS), carried out in 1992, 1993 and 1997 by the Aga Khan University and the National Institute of Child and Human Development includes information on causes of death (and morbidity) in selected areas of the country.

In the near future various agencies are planning surveys related to MCH: NIPS is planning the Pakistan Demographic and Health Survey in 2005, and a Maternal Health Survey (MHS) in 2006 is being discussed by USAID, DFID and others. Given the number of cross-sectional surveys, it would be useful for Pakistan to come to an agreement with development partners on one survey to track a key set of indicators.

[14] United Nations. 2004, op cit.

2.3.3 Health Management and Information System (HMIS)

In 1992, the MOH developed and implemented HMIS for FLCFs. "It was designed to improve coverage and quality of health care interventions, for disease surveillance and epidemic control".[15] The main purpose was not to gather but to use information to improve action and to provide better health services. The information is obtained through the provincial HMIS cell from all districts and peripheral health facilities that use the HMIS monthly and yearly formats. By 1998, the HMIS/FLCF was used at most government primary care facilities, and in subsequent years, its use has been extended to many out-patient departments in Tehsil/Taluka and in district hospitals. By 2001 the number of districts reporting through the HMIS computerized data processing system was 115 out of 122. A larger part of the report is devoted to primary health care services with a focus on MCH services. The gathered information refers to health care facilities, health problems, and resources.

BOX 7. Public health care facility network
(those with HMIS are underlined)

- ✓ 946 hospitals (district, provincial and tertiary care)
- ✓ 4,835 dispensaries
- ✓ 344 TB clinics
- ✓ 1085 MCH Centers
- ✓ 572 Rural Health Centers -RHC
- ✓ 5,798 Basic Health's Units -BHU
- ✓ 354 Taluka/Tehsil and District hospitals – OPD only

The monthly FLCF report form includes considerable information on vital events. However, very few events are actually reported. This is because FLCFs only record births and deaths that occur within their facilities - and most births and deaths occur either at home or in a hospital. Information available on the HMIS form includes: number of births; percentage of newborns weighed; percentage of low birth weight; and percentage of births recorded compared to expected. There is also an FLCF Maternal Health Register that records the number of deliveries, stillbirths, abortions, deliveries by skilled personnel, and maternal deaths.

A national feedback report (NFR) is compiled from the data received by the federal HMIS office from the provincial HMIS cells, which get their information from the respective districts and facility-based HMIS monthly report forms. However, since it only provides information from FLCFs and hospital OPDs the birth and death information obtained has very limited usefulness for planning and policy making.

2.3.4 Community-Based Information: LHW-MIS

The LHW program lies within the National Program for Family Planning and Primary Health Care (NPFPHC). It was created in 1994 "to achieve universal health coverage by addressing primary health care problems in providing promotive, preventive, curative and rehabilitative services at the doorstep of the community and also to expand family planning services availability in urban slums and rural areas of Pakistan"[16] The LHW-MIS generates information directly from the community and was designated to collect information from the covered population about demographic aspects (including births), morbidity and mortality details, socioeconomic status, community, inputs and services provides by the program.

[15] HMIS. "National Feedback Report". Health Management and Information System. Ministry of Health of Pakistan. Islamabad, 1996.
[16] National Programme for Family Planning and Primary Health Care. "Module on Use of Information (LHW-MIS) at District Level. Facilitator's Manual". Ministry of Health. Government of Pakistan. Islamabad. 2004.

72,000 LHWs use a family register and client record card to record all the mentioned information and then consolidate it in a monthly report at the community level. Information from the community is aggregated at the FLCF level and then at the district level in monthly reports. The LHW-MIS recently developed software to capture this information and is implementing it in some districts. The LHW program covers about 50% of the population (about 65% of the target population). Each LHW covers approximately 200 households (1,000 people). The information on vital events registered by the LHW-MIS is: number of live births; number of stillbirths (pregnancy more than 7 months); number of all deaths; number of early neonatal deaths (within 1 week of birth); number of infant deaths; number of maternal deaths. Also, the number of newborns weighed; percent of low birth weight babies; number of abortions (pregnancy less than 7 months); and number of deliveries attended by skilled personnel.

In 2003 the LHW-MIS reported 765,875 births, 42,000 infant deaths, 108,676 total deaths, and 615 confirmed maternal deaths out of 2000 reported (see Box 8). This represents only 41% of expected births, 22% of expected deaths, and 30% of expected infant deaths. However, using only the births that LHWs recorded as a denominator, the percentage of expected infant deaths reported increases to 72%. Using this denominator the IMR in the LHW catchment areas would be 54/1000 live births.

BOX 8. 2003 LHW-MIS Information

No. of births (total) estimated by NIPS	4,350,000
No. of births expected in LHW areas	1,850,000
No. of births recorded by LHW-MIS	765,875
No. of deaths (total) estimated by NIPS	1,120,000
No. of death expected in LHW areas	500,000
No. of deaths recorded by LHW-MIS	108,676
No. of infant deaths (total) estimated by NIPS (Based on IMR of 75 / 1000 live births)	326,250
No. of infant deaths expected in LHW areas (based on expected births and IMR of 75)	138,750
Number of infant deaths expected (Based on LHW births recorded and IMR of 75)	58,000
No. of infant deaths recorded by LHW-MIS	42,000
IMR for LHW areas based on recorded births	54 / 1000

2.3.5 Verbal Autopsies for Maternal Deaths

In 2003 the LHW program began a system to verify maternal deaths and to obtain additional information. When an LHW reports a maternal death, the LHV or a medical officer accompanies her to the woman's home to determine if in fact the death was a maternal death (defined as "a death during pregnancy or within 42 days of the end of a pregnancy from causes related to the pregnancy or its management"[17]). If the death is confirmed as maternal, a verbal autopsy is carried out to identify the causes and circumstances surrounding the death. Knowing the number of deaths is not enough. Information from verbal autopsies should assist health policy-makers in implementing interventions to prevent deaths in the future. This system in Pakistan has just begun to produce information and the first report is still in draft form. It will be important to assure that the information is utilized for actions to prevent maternal deaths.

2.4 Other MCH Information Sources

Hospitals are an integral and essential part of the MCH care system. The information they theoretically provide is key to understanding whether the system is working to the benefit of women and children. In particular, it is important to know whether women with obstetric emergencies are being referred and receive adequate emergency obstetric care.

In Pakistan, as noted in other chapters, there is no standard hospital information system. The team visited a few hospitals, and found that staffs make efforts to monitor the rate of

[17] WHO definition of maternal death.

complications such as eclampsia, hemorrhage, infection, stillbirths and cesarean sections. However, this important information is not incorporated into a hospital data base nor is it forwarded to the DOH. As a birth certificate, staff provides women who deliver with a piece of paper that includes the child's name and the date and time of birth which the parents can take to the union council to properly register the birth.

The Women's Health Project, financed by the ADB, includes the implementation of a system to monitor obstetric complications and birth outcomes in 20 districts (see Box 9). These indicators, if instituted, will provide the districts with critical information districts to utilize in assessing the effectiveness of the referral system for obstetric emergencies. However, it is still not clear how this system will be institutionalized after the project is completed.

BOX 9. Monthly Hospital Obstetric Indicators Proposed for Women's Health Project

% expected births delivered
% expected births by C-section
% expected pregnancies admitted with complications
% expected births with PPH
% expected births with obstructed labor / ruptured uterus
% expected births with sepsis
% stillbirths
% neonatal deaths
% LBW
Obstetric case-fatality rate

2.5 The Sample Vital Registration and Verbal Autopsy (SAVVY) Option

The paucity of district and nationally representative information on causes and risk factors for maternal, infant and child mortality is a major obstacle for planning and implementing interventions based on priorities. Achievement of complete coverage of birth and death registration in Pakistan requires a long-term plan. While vital statistics may become available quickly in some districts, national, provincial and data for many districts will not be available for at least 5 and up to 10 years (until NADRA expands the pilot nationally and good quality health data are available). Sample Vital Registration with Verbal Autopsy (SAVVY) is a community based longitudinal information system that generates nationally-representative and district specific information on cause-specific mortality and other health and socio-demographic indicators (see Box 10). A SAVVY system represents an option for obtaining representative data on births and deaths in the short and medium term while a complete vital registration (VR) system is being developed. At the same time it can increase capacity in the collection, analysis and utilization of vital events data, thus preparing the way for a complete VR system.

SAVVY is not necessarily an alternative to household surveys (like DHS) or to routine health information systems. There is critical information to be gotten from each of these. Each has a role in a comprehensive national information strategy. Nevertheless, a SAVVY system can provide much of the information currently being provided by surveys more cost-effectively and on a systematic, continuous basis. There exists substantial potential in the roles of existing institutions and systems for sample vital registration and verbal autopsy planning and implementation. If SAVVY were to be implemented in Pakistan, it should harness the strengths and experience of existing institutions, and produce quality demographic and health estimates on an annual basis. The MOH/HMIS knowledge of the local health system, previous experience with the FBS in sample design, cartography, field operations, and data processing coupled with the network of the Lady Health Worker program and NADRA make the partnership ideal.

2.5.1 Why Should SAVVY be Implemented in Pakistan?

- There is general acknowledgement of the need to improve community based health information among the district, provincial, national health authorities and development

partners There is a lack of community-based information that provides longitudinal data on cause-specific mortality in all ages, and maternal and child mortality in particular. Access to facility based health services is limited.

- Human resource capacity to implement SAVVY exists: LHWs, vaccinators or staff at FLCFs can be recruited to register births, deaths and perform verbal autopsies.
- Large investments have already been made in systems that collect birth and death data, and this means the operational costs will be lower and the tasks and procedures familiar. However, it will require adaptation of the birth register, revision of the maternal mortality verbal autopsy tool, and installation of coding procedures for the causes of deaths.

BOX 10. Sample Vital Registration with Verbal Autopsy

Accurate statistics on basic demographic events are lacking for the vast majority of the world's poorest countries. Sample Vital Registration with Verbal Autopsy has been proposed as the best option to collect data on social and demographic indictors that then can be used for planning, implementing, and evaluating policies. SAVVY uses a validated verbal autopsy tool to ascertain causes of death at all ages including:

- Stillbirth, perinatal, and neonatal mortality
- Diarrheal disease
- Acute respiratory infection, malaria
- Maternal mortality
- HIV/AIDS
- Tuberculosis
- Injuries and accidents
- Non-communicable diseases

A SAVVY system would collect socio-demographic data from a number of sites throughout the country selected using multi-stage probability sampling. This system would provide nationally and provincially representative statistics for many indicators. The total number of SAVVY sites depends on a number of factors including total population and available resources.

The foundation of SAVVY is **demographic surveillance**. Following an initial census of SAVVY sites to determine resident populations, a network of supervised lay reporters continues to enumerate all births, deaths, and migration through annual or semi-annual 'census'-update rounds. An active system of **mortality surveillance runs** in parallel to the census system in which all deaths are followed up at the household with a verbal autopsy interview by trained staff. Medically trained coders review the interview forms and determine the probable cause of death. Census update rounds offer the chance for **nested surveys** on health service coverage, family planning and reproductive health, poverty, and behavioral risk. As part of a well-coordinated national information strategy, SAVVY data can be compared to results of national household surveys such as the DHS, MICS, or Household Budget surveys. SAVVY can also serve as a sampling frame for **special studies**, including 'health examination surveys.' To facilitate the implementation of a SAVVY system, a phased-in approach is recommended in which sites are established over time, according to the capacity of the host country to implement, manage, and sustain them.

Reliable national estimates of mortality and poverty indicators can be obtained from a fully functional SAVVY system. Data can be aggregated over multiple years to produce reliable estimates for sub-national areas, age groups, poverty groupings, and trends over time. The production of routine system outputs can be tailored to local planning and budgeting cycles. For example, an annually-updated profile can be produced consisting of:

- The proportion of the mortality amenable to locally available and cost-effective interventions;
- Data on use of maternal/family planning services, and interventions such as oral dehydration therapy;
- Information on education, occupation, housing conditions, food security and poverty levels.

Indicators for several national and international initiatives can be generated by SAVVY, these include: Poverty Reduction Strategies, the Safe Motherhood Initiative, MDGs, UNGASS, UNAIDS, and the Global Fund to Fight AIDS, TB and Malaria.

2.5.2 Issues for Setting up a SAVVY System in Pakistan

The main objective of SAVVY in Pakistan would be to produce annual nationally-representative sample estimates of mortality rates by cause, with a focus on maternal and child health, as well as other vital statistics, health indicators and related socioeconomic characteristics. It is also important to provide reliable estimates of annual trends in mortality rates and other indicators, through a longitudinal approach in the data collection in sample areas (district and provincial levels) and in the analysis. Ideally, in the medium term, this system should be designed to produce reliable mortality estimates on all causes of death (including communicable, non-communicable diseases, injuries and risk factors).

2.6 Conclusions: Strengths and Gaps

2.6.1 Strengths

NADRA has a state of the art computerized information system and has developed birth and death registration software which is being piloted in Lahore and Sialkot. NADRA provided financing, technical assistance, and training for the pilot. The computerized birth registration system in Lahore has been implemented in 150 union councils and is already providing data to the district. A death registration pilot is being started. This computerized birth and death registration system will be expanded nationwide. These systems will permit linkages to the NADRA data base that includes demographic and socioeconomic information. It is potentially a very powerful system with a wealth of information that could be used in the long term for a variety of analytic studies. The leadership at NADRA expressed interest in working with other government ministries to better take advantage of the information in its system.

There are information systems in place that provide MCH data at all administrative levels. These include the HMIS, LHW-MIS, and periodic surveys such as the PDS, PIHS, PHFPS, and MICS. These systems form a basis for monitoring maternal, infant and child mortality that is fundamental for MCH surveillance. Each system has strengths and limitations. Periodic surveys provide the most accurate estimates of maternal and infant mortality. However, they do not provide district level estimates. The LHW-MIS provides information on births, deaths and some process indicators from communities served by LHWs - about 50% of the population. The HMIS provides information on births and deaths in FLCFs. New systems for capturing hospital information are being developed by the Women's Health and UNICEF projects.

LHW program provides maternal and child mortality information. The LHW program provides continuous information on births and deaths in the villages it covers. At the moment, this is the most comprehensive information on births and deaths available in Pakistan. This information is consolidated at the FLCFs and then at the district level. Districts and provinces use it to provide estimates of infant and maternal mortality.

A verbal autopsy system has been initiated for maternal deaths and has great potential. The first analysis of information provided by the verbal autopsies is just being completed. In this round of verbal autopsies the focus has been on ascertaining the clinical cause of death (hemorrhage, eclampsia, obstructed labor etc.) In addition, the system has potential for collecting more information related to the circumstances surrounding the death (called a social autopsy) that could provide evidence for interventions to prevent such deaths in the future.

Sporadic structures are in place that could be tapped to improve MCH surveillance and information systems. For instance, in Sindh province every district has an Assistant District

Coordinator (ADC) for MCH. These ADCs are the focal points for assessing progress in reaching MCH objectives and for making recommendations for further improvements. Likewise, most provinces have an MCH focal point, though often poorly staffed and with limited resources.

Devolution provides opportunities for more effective and timely decision-making. Health districts are smaller administrative units that permit a better grasp of local situations. It is easier for them to monitor the pulse and problems in their catchment areas. Local political accountability to the communities and their well-being is also more likely in this scenario.

2.6.2 Strategic Gaps / Needs:

Vital birth and death registration coverage is very low and there is no collaboration at the national level on the vital registration NADRA is piloting in Lahore. Civil registration is carried out by union councils. Birth registration is low and death registration is negligible. The DOH does not utilize information captured by the civil registration authorities. NADRA is implementing a new registration system in Lahore and expects registration to reach 80% over 3-5 years. In that case, the district health authorities are involved and plan to utilize the data. However, at the national level there has been no discussion with NADRA about improving the type of information collected and the links with health authorities - despite the potential this information has for monitoring progress towards reducing maternal and infant mortality.

Standardization, quality and timeliness of data are important issues. Standardized birth and death certificates with WHO recommended information are not being contemplated. Birth and death certificates are not standardized, even in hospitals. Nor are they computerized, except in the pilot in Lahore. Little information useful for health analyses is provided. Cause of death information is generally unavailable.

Other sources of birth and death reporting are incomplete and estimates used by various programs are not comparable. While LHW birth and death reporting is very promising, a quick analysis shows that the numbers being reported are still improbably low. A total of around 800,000 births were reported by LHWs in 2003 (where around 2 million would be expected). The reasons for this under-reporting should be explored and actions taken to improve it.

Information systems are fragmented and uncoordinated and therefore do not provide a comprehensive picture of the MCH situation, particularly at the district level. The information from the two systems that provide continuous information at the district level – the HMIS and LHW-MIS – is not consolidated. At the present time, they are two separate systems that provide information for two separate programs. The HMIS provides information on MCH from facilities, and the LHW-MIS provides information from communities. They are like two pieces of a jigsaw puzzle that are never put together and interpreted as a whole to provide a more comprehensive picture of the health of mothers and children in the district.

Hospital information on maternal complications and mortality is not available. Access to quality essential obstetric care for emergencies is a basic component of the maternal mortality prevention strategy. Obstetric emergencies are managed in hospitals. However, districts and provinces have no hospital information about maternal complications and their management. With a few exceptions, they do not even have information about maternal mortality in hospitals. This is a major gap. In order to understand whether the health system is working for mothers and children, data from hospitals are a critical piece of information. That data will become increasingly important as the proportion of births in hospitals slowly increases. It is already a major issue in urban areas where the majority of births take place in hospitals.

Lack of adequate institutional structure to support work on MCH, with multiple units/programs involved without effective national or provincial coordination. There is no national body for elaborating national MCH policies, making plans, and monitoring implementation. There are multiple, fragmented MCH programs financed by the MOH and various development partners working in different provinces and districts without effective coordination. This fragmentation is mirrored at the provincial level. While there is an ADC for MCH in Sindh, this is not the case in other provinces.

There is limited human resource capacity and information is not used for decision-making. This was a rapid assessment. However, there was little evidence that whatever information was available was being used for decision-making to improve maternal and child health in the visited districts and provinces. There appears to be a gap in the capacity to utilize information adequately for planning, policy development, and monitoring.

There is an outdated and incomplete information and communications infrastructure. Vital registration is not computerized except in Lahore. Hospital information is not standardized or computerized. HMIS and LHW information is generally computerized at the district level; however, the information systems are not integrated, and many systems are completed outdated.

2.7 Recommendations:

2.7.1 Vital Registration and Statistics

Elaborate a long-term plan (10 year) to develop a complete vital registration and statistics system. Given the current very low levels of vital registration, achieving full coverage will take time. NADRA has begun piloting a vital registration system and estimates it can reach 80% coverage over 3-5 years. This will require a collaborative effort between union councils, health districts and community health workers (LHWs, vaccinators, etc.) However, reaching the remaining 20% of the population will take longer. A ten year timeline seems reasonable for a goal of full coverage.

Work with NADRA and union councils to assure the success of plans to expand the Lahore pilot for birth and death registration to other districts and improve the health information obtained. Once the pilot in Lahore and Sialkot are completed the computerized process of birth and death registration will be expanded to all union councils. The potential benefits of such a system for providing data vital to health cannot be overstated. In order to capitalize on this potential, the MOH should designate a technical group to work with NADRA as the system expands. The technical group should also work with NADRA to improve the information being collected and include health data such as that on the WHO recommended birth and death certificates. Community health workers will be a very important force in helping assure that all births and deaths are registered, and this will require coordination with the MOH.

Standardize birth and death certificates using WHO recommendations. The standardized birth certificates provide a wealth of information on risk factors (such as birth weight, birth complications, type of delivery etc.) that are important for the development of effective interventions to improve maternal and neonatal outcomes. Standardized death certificates include not only the immediate cause of death but the underlying causes. Standardized birth and death certificates may not be appropriate for community births and deaths but should be developed and applied in hospitals and other health facilities.

In the short- and medium-term strengthen coverage of birth and death reporting through MCH programs (LHW, HMIS, Hospitals, and private sector). Birth and death reporting ongoing via the LHW-MIS should be strengthened to increase coverage and studies carried out to validate the completeness of coverage of births and maternal, infant and child deaths. Hospital data on births and deaths should be incorporated into the district reporting system. The private sector should be slowly involved in the reporting process.

In the medium term implement a SAVVY (Sample Vital registration and Verbal autopsy) system that provides at a minimum annual national and provincial level estimates for cause-specific mortality rates and risk factors. A SAVVY system can be a source of demographic and mortality information that is representative at the national, provincial and even potentially at the district level. It can play a role in filling information gaps while the vital registration system is being developed. It would provide a continuous stream of information and play a role in system development. The verbal and social autopsy components would provide valuable information about why the person died. The costs of providing information representative at the district level would have to be assessed. It could be phased in over time as part of a plan to build a complete vital registration system. The recommendation is to include all age groups in the verbal autopsy system. Nevertheless, depending on costs, the verbal autopsies could be limited to certain age groups of particular interest e.g. children and women of reproductive age.

2.7.2 MCH Surveillance

Develop and finance an effective MCH organizational structure at all administrative level. There is no unit at the national level responsible for providing leadership and coordination of the disparate programs currently being implemented. Policy-making is piecemeal and implementation of policies is ineffective. Reduction in maternal and infant mortality has clearly been established as top health priorities. A unit responsible for MCH activities should be established at each level to ensure that the country's health goals will be reached.

Develop more comprehensive information systems particularly at the district level. The JICA project has undertaken an extensive evaluation of the HMIS. The following recommendation echoes some of those of the JICA project:

- ***Consolidate MCH information from various sources at the district level.*** Information from LHW-MIS and HMIS should be consolidated at the district level to provide a comprehensive picture of the MCH situation.
- ***Include standardized hospital information to permit a systems approach to analysis of the MCH situation.*** The referral system for obstetric emergencies is a key strategy for maternal and infant morality reduction. Hospital information is crucial for understanding how well the system is working including the timeliness of referrals and the quality of care provided.
- ***Strengthen and expand the system of verbal autopsies to provide better information for decision-making.*** After the initial evaluation of the first full year of verbal autopsies, consideration should be given to expanding the data collection instrument to include other information about why the woman died besides just the clinical reason. Such information could help develop more effective interventions to reduce maternal deaths.

Build capacity (aggregation, analysis, utilization). Capacity-building in data collection, aggregation, analysis, interpretation and particularly utilization for policy development, planning, intervention implementation, and monitoring performance and results at all levels is critical to the achievement of MCH objectives.

CHAPTER-3: NON-COMMUNICABLE DISEASE INJURY, AND RISK FACTOR SURVEILLANCE

3.1 Background and Methodology

Pakistan has a large communicable disease problem, accounting for 40% of the burden of disease and 45% of mortality. At the same time, the burden of NCD is increasing. Major NCD includes cardiovascular diseases, diabetes, cancer and chronic respiratory diseases. NCD and injuries are among the top ten causes of mortality and morbidity in Pakistan,[18] accounting for approximately 25% of the total deaths within the country.[19] To a large extent, these chronic diseases are preventable.[18,20]

An epidemiological and demographic health transition with an increase in NCD is already occurring in urban areas where behavioral risk factors such as smoking, unhealthy diet, and lack of physical activity tend to be more prevalent. These health risk behaviors play an important role in the development of NCD. Focusing interventions on modifiable risk factors will prevent NCD before they occur. The high cost of care for preventable NCD (e.g. heart disease, cancer, diabetes) places a large burden on the health care system and requires the displacement of resources that could be used otherwise.[21]

A key goal, therefore, in addressing NCD is to strengthen the effective implementation of public health programs and policies aimed at reducing modifiable risk factors. To accomplish this goal, surveillance of NCD and their underlying risk factors must be strengthened so that a useful evidence base is generated for tracking trends and planning, implementing, and evaluating programs and policies designed to improve health outcomes.

The assessment was conducted in Islamabad and Rawalpindi District from August 16-21, 2004 through interviews with key stakeholders and technical experts, and by reviewing the current availability and utilization of information on incidence and prevalence of NCD and risk factors, mortality and morbidity statistics, cancer registries, injury and mental health information, and the pilot of the population-based NCD risk factor survey. A consultation meeting was held on August 18 with key partners. Agencies represented at the meeting include: MOH, Heartfile, WHO, LHW Program, Network for Consumer Protection, PMRC, PIMS, International Diabetes Federation, Rawalpindi General Hospital, Peshawar Medical College, Aga Khan University, Zia Uddin Medical University, Shaukat Khanum Memorial Trust, and the World Bank.

3.2 National Action Plan for NCD

To address NCD prevention and control strategically, in 2004 the Pakistan MOH, in partnership with WHO and Heartfile, developed a National Action Plan for Prevention and Control of NCD and Health Promotion (NAP).[22] (See Box 11). The impetus for developing NAP came from the

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[18] Hyder AA, Morrow RH. Lost Healthy Life Years in Pakistan in 1990. Am J Public Health 2000,90(8):1235-40.

[19] Federal Bureau of Statistics, Statistics Division. Pakistan Demographic Survey 2001. Islamabad, Pakistan: Government of Pakistan.

[20] Federal Bureau of Statistics, Statistics Division. Pakistan Integrated Household Survey 2001/02. Islamabad, Pakistan: Government of Pakistan.

[21] World Bank, SASHD. Pakistan: The Pubic Health Surveillance System: An assessment of current status, strategic direction and investment needs, concept paper, 2004.

[22] Ministry of Health, Government of Pakistan, World Health Organization, and Heartfile. National Action Plan for Prevention and Control of Non-Communicable Diseases and Health Promotion in Pakistan, 2004. Nishtar S. Prevention of non-communicable diseases in Pakistan: an integrated partnership-based model. Health Res Policy Syst. 2004 Sep 13;2(1):7. Nishtar S. Pakistan's National Action Plan on Chronic Diseases. BMJ 2005 (In press.)

NGO Heartfile, which also contributed its technical expertise and resources to develop the NAP. Development of the NAP involved extensive input and consensus building from institutions and professionals across the range of critical NCD topics, which have been expanded to include injuries and mental health. The NAP provides a comprehensive approach for tackling NCD, promotes utilizing data collected through surveillance as an evidence-base for making effective decisions, and identifies recommended priority policy and other public health actions to be taken to address specific NCD and risk factors, including: cardiovascular diseases, diabetes, and tobacco use, chronic respiratory diseases, cancer, injuries, and mental illnesses. Population-based surveillance of NCD risk factors is a top priority of this plan which argues it would provide an understanding of the prevalence of these health problems, monitor trends over time, and evaluate the progress and impact of prevention and control actions taken. The NAP includes an action agenda that addresses each of the key topics. Since many NCD prevention activities and actions are related (e.g. community behavior change activities) they were placed within the context of an Integrated Framework for Action (IFA). Pakistan is one of a handful of developing countries with an NCD NAP, which may, in turn, serve as a useful model for other countries.

BOX 11. National Action Plan for Prevention and Control of Non-communicable Diseases and Health Promotion in Pakistan

In Pakistan, the public-private tripartite collaborative arrangement, led by the NGO Heartfile and constituted additionally by the Ministry of Health, Government of Pakistan and the WHO Pakistan office launched a partnership in April 2003. The terms of the partnership are stipulated in an official agreement that gave Heartfile a lead role in developing and implementing a national strategy for achieving national goals for the prevention and control of NCD. The exercise was the first opportunity to mount a truly 'National Plan of Action' with the Governments commitment to NCD as a priority and to enlist a broader range in inputs from within Pakistan for addressing a challenging issue.

The partnership released a strategic framework for action – the NAP-NCD – an integrated approach to the addressing the multidisciplinary range of issues within a prevention and control framework across the broad range of NCD. This Plan is a concerted and comprehensive approach to addressing the challenge posed by NCD in Pakistan – one that incorporates both policies and actions. It is set within a long-term and life course perspective and calls for an institutional, community and public policy level change. It has been designed to overcome the tendency to rely on a disjointed set of small scale projects, factoring integration at four levels; grouping NCD so that they can be targeted through a set of actions, harmonizing actions, integrating actions with existing public health systems and incorporating contemporary evidence-based concepts with this approach. The Action Plan delivers an Integrated Framework for Action (IFA). The IFA has been developed as a concerted approach to addressing the multidisciplinary range of issues within a prevention, control and health promotion framework across the broad range of NCD. It is modeled to impact a set of indicators through the combination of a range of actions in tandem with rigorous formative research.[23]

This partnership is in harmony with national health priorities, complements state initiatives and is optimally integrated with national health systems. The tripartite partnership has brought value to all the three partners. By leveraging on the technical strengths of a private sector partner – Heartfile – the Ministry of Health was able to include NCD prevention and control as part of its policy framework. By partnering in this program, the NGOs activities are contributing to the country's National Plans within the framework of priorities set by broad-based national consensus, and are being implemented through existing structures and monitored through one evaluation mechanism. And WHO is expanding partner support through the application of a national model that provides country resources to the private sector which in the past have been typically set aside for the public sector.

[23] The document can be accessed at http://heartfile.org/napdoc.htm

3.3 Current NCD Information Systems

3.3.1 Behavioral Risk Factor Surveillance

In Pakistan, NCD data collected have primarily focused on the diseases themselves, rather than on the modifiable risk factors that assist prevention efforts. In addition, previous data have not been collected within the framework of an integrated system, where all key NCD risk factors are contained in a single surveillance system. Prior NCD data collection also has not yielded nationally representative estimates, data collected across time through systematic and repeated data collection cycles, and data have not been effectively linked to program and policy planning.

As noted previously, the focus of NCD surveillance must be on the prevalence of modifiable behaviours (e.g. tobacco use, physical inactivity, poor dietary habits and seat belt and helmet use) and other modifiable risk factors (e.g. weight and blood pressure) in the population that strongly contribute to the development of prevention of NCD and injuries. (Box 12). This information provides an effective evidence-base for targeting and monitoring NCD prevention and control programs. A focus on the prevalence of disease is not effective as a principle surveillance strategy because the presence of NCD demonstrates a failure to take preventive public health action.

BOX 12. NCD risk factor survey topic areas and questions

Topic area	Questions
Demographic Questions	Gender Marital status Birth date Education level Work status Household Income
Knowledge, Attitude, and Perceptions	Heart attack Physical activity Diet Obesity Tobacco Substance use High blood pressure Stroke Diabetes Cancer Mental health Epilepsy Access to health care Health care status Economic impact
Risk Factors	Physical activity Diet Tobacco use Blood pressure history Diabetes Coronary heart disease Stroke Injuries Mental health
Anthropometry	Height Weight Waist circumference Blood pressure

The NAP's Integrated Framework for Action contains a common population surveillance mechanism for assessing behaviors and other risk factors that cause NCD. As a part of the NAP, a pilot population-based risk factor survey was being implemented in Rawalpindi District at the time of this assessment. The survey is being led by the NGO Heartfile in collaboration with the MOH. The plan is to evaluate the survey and then expand it for implementation across the nation. The MOH had allocated a budget for the pilot activity; however initial delays in funding releases prompted Heartfile to arrange funding support from the CDC through a collaborative agreement with the WHO. These funds were made available at a critical time and enabled the pilot activity to be completed according to the scheduled time. Box 12 provides a listing of the risk factors included

in the survey questionnaire. [24] The information obtained from these surveys will provide important baselines for the work outlined in the NAP. Dissemination and information sharing will be important to its success.

As part of the assessment process, a field visit was made to a neighborhood within the Rawalpindi District to observe the pilot that is currently underway. It was observed that the community-based data collection procedures are following a strict scientific protocol to help ensure consistencies across interviewers and to make sure that the random sampling procedures are strictly applied. When fully implemented, this survey will provide nationally representative information and a solid baseline on which to evaluate future trends and the impact of NCD prevention program activities.

3.3.2 Mortality Information

As noted in the chapter on vital registration, Pakistan does not have a functioning system for reporting mortality data. Coverage is very low and the quality of the information is poor with causes of death not identified. Sentinel sites have not been utilized to test mortality data collection, reporting, and use. The NAP states that "a necessary prerequisite for effective planning, implementation and evaluation of NCD prevention programmes is access to reliable and timely information on mortality, morbidity, risk factors and their socio-economic determinants (page 22)." The NAP further goes on to say that excluding cancer and stroke, estimates provided through disease mortality surveillance are insufficient for Pakistan because deaths are not registered. The NAP recommends assessing the feasibility of establishing a mortality sentinel site to determine whether the resulting data can adequately provide information to generate reasonable estimates of mortality for Pakistan's large population.

3.3.3 Morbidity Information, Registries, and Sentinel Surveillance

The NAP indicates that morbidity data exist on high blood pressure, diabetes, cancer, mental illness, and road traffic injuries. During the consultation meeting on August 18, 2004, many stakeholders agreed that they have sufficient information from morbidity studies to demonstrate the need to address the prominent NCD identified in the NAP. Given the few available resources, consensus was reached that conducting population-based morbidity studies was not a priority.

Population-based risk factor data needs to be supplemented by facility-based data collection systems and stand-alone data sources wherever applicable. Hospital information can be useful for monitoring the prevalence of NCD and their complications. However, a hospital reporting system that assesses types of admissions currently does not exist. Consequently, hospitals cannot be evaluated at the national level for disease trends, performance or costs related to NCD. Nevertheless, some hospitals in Pakistan have begun developing their own computerized information systems to address management needs including performance monitoring. Data quality also remains an important issue to be addressed.

Despite the fact that cancer produces a huge burden for Pakistan, a national cancer registry does not yet exist. However, an excellent registry model exists in Karachi, which meets international criteria. The NCD National Plan of Action recommends that up-grading and consolidation of cancer registration take place in line with the Karachi model, that resources be allocated based on

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[24] Nishtar S. Amjad S, Iqbal A. Integrated population-based surveillance of non-communicable diseases – the Pakistan Model. Am J Public Health 2005; in press.

priorities, and that these resources be ensured to allow continuous monitoring of cancers across Karachi and other designated areas.

Registries are also recommended to monitor strokes. However, the NAP indicates that establishing population-based registries to collect stroke morbidity and mortality data would have huge logistic and methodological issues rendering it too impractical for Pakistan in the short term. Risk factor burden as a proxy is recommended instead.

Data collection through sentinel sites can yield more detailed information about NCD mortality, morbidity, and risk factors to complement the data collected through population- and hospital-based surveillance efforts. Sentinel surveillance sites are recommended as an NCD surveillance strategy to address NCD priorities. The August 18 consultative meeting recommended creating sentinel sites for road traffic injuries and burns.

3.4 NCD Prevention and Control Programs

Decentralization of political, administrative, and financial powers to the district governments has recently begun in Pakistan. While pilot testing of the population-based NCD risk factor survey had begun in the Rawalpindi District with plans to expand nationwide, surveillance responsibilities at the provincial and district level have not yet been clarified. Because the integrated surveillance work in the field of NCD is only now beginning, this is an opportune time to address capacity building in the NCD field. A successful surveillance system for NCD will require capacity at all three levels, but particularly at the level where programs will be executed to address these diseases – the province or the district.

As noted earlier, in order for surveillance data to be of any use the information obtained must be linked to NCD prevention and control programs. Prevention is far more cost-effective than treatment, is recommended in resource-poor countries like Pakistan and is emphasized in the NAP. While follow-up efforts have outlined the roles and responsibilities of the public and private sector partners in this effort,[25] there is a need to further refine these and to develop a mechanism which can hold partners accountable. The NAP has also outlined priority areas in each of the disease-domain Action Agendas. The collaboration begun with the elaboration of the NAP has not been formalized in a manageable structure at the level of the provinces in particular and the departments of health generally do not have focal points for NCD activities.

3.5 Human Resources, Infrastructure and Capacity

To provide systematic population- and hospital-based data, as well as detailed data obtained through sentinel data collection sites, and to ensure that the data collected are effectively linked to public health action, human resources, infrastructural support, and technical training are required. The assessment revealed that this is an area that urgently needs to be strengthened so that NCD surveillance and data use (program and policy planning, implementation, and evaluation) capacity can be improved.

Human resources suffer both in terms of insufficient numbers of trained professionals to adequately address the health care needs within various NCD fields and in terms of an unclear delineation of roles and responsibilities across institutes and professionals in the collaborative

[25] Ministry of Health. Planning Commission (Health) PC-1: National Action Plan for Prevention and Control of Non-Communicable Diseases and Health Promotion in Pakistan, F.NO.25-21/2003-Planning. Islamabad, Pakistan: Government of Pakistan, 2003. Http://heartfile.org/napppp.htm

work beginning to take place. Infrastructure suffers from an insufficient number of existing institutions to adequately address NCD health care needs, a need for the up scaling of services provided, a lack of NCD relevant policies and their enforcement, and a lack of equipment required to support the prevention and control work.

The need for training was identified as a top priority during the assessment, especially in the areas of research, data analysis, and translating data for public health action. Most professionals currently do not have public health training for addressing the complexities associated with NCD prevention. Traditional medical training is not sufficient for addressing the multi-sectoral nature of the risk factors associated with NCD, injuries, and mental health, nor for approaching NCD from a population-based perspective, nor for tackling the challenging prevention issues.

3.6 Conclusions – Strengths and Gaps

3.6.1 Strengths

A National Action Plan for the prevention and control of NCD and injuries is published with surveillance included in action agenda. A considerable amount of work has already been done in bringing key stakeholders from all sectors together - MOH, private, academic and community - to elaborate a consensus-based National Action Plan for the prevention and control of NCD. The plan addresses NCD through a comprehensive and strategic approach which will maximize the potential impact for addressing these relatively new heath problems. Population-based risk factor surveillance, which will yield the most useful data for NCD prevention was identified as a priority for the action agenda. Emphasis is placed on an integrated approach to collecting information across the entire domain of NCD and risk factors.

Signed tri-party MOU between MOH, WHO, and Heartfile demonstrate willingness for strong public/private partnership. A tri-party partnership developed the NAP with input and consensus building from many other stakeholders and technical experts.[26] The signed agreement allows for a long-term multi-sectoral partnership approach to address NCD prevention and control strategically and to increases the likelihood that the NAP will be implemented.

Pilot for an integrated population-based NCD risk factor survey is underway, with plans to expand nationally. The NCD National Plan of Action identifies population-based surveillance of NCD risk factors as a priority. An integrated surveillance model was designed and piloted in the Rawalpindi District to monitor risk factors and knowledge, attitudes and practice related parameters across all critical NCD; it included injuries and mental health. Follow-up plans include evaluating the pilot, making any necessary changes, and implementing data collection at the national level. Resources need to be committed by the Ministry for this purpose.

Injuries and mental health are incorporated into the integrated chronic disease framework. The current and projected burden due to injuries and mental health, and the inter-related linkages between some of the key risk factors for these important health issues strongly support their inclusion into the larger NCD strategic framework. This has been accomplished through the NAP. The establishment of the National Program for Mental Health in 1986 and the new ordinance for mental health passed in 2001 (replacing a 1912 ordinance) reflect the MOH's commitment to addressing the critical burden of mental illness in Pakistan. Future public health efforts aimed at injuries and mental health should be pursued within the NAP framework.

[26] Memorandum of Understanding: National Action Plan for the prevention and control of non-communicable diseases and health promotion in Pakistan. http://heartfile.org/napmou.htm

Karachi cancer registry provides a good model for replication in other locations. Although nationally representative data are currently lacking, Karachi has a cancer registry that conforms to CI 5 standards. This model can be replicated in other Pakistan regions.

Structures are in place to begin demonstration chronic disease interventions. There are a number of public health activities currently being implemented in various districts across the country. Although these efforts remain uncoordinated at a provincial or federal level, they demonstrate sufficient infrastructure to begin the prioritized and systematic work identified in the NAP.

3.6.2 Strategic Gaps / Needs

Weak structure within the Ministry of Health to take responsibility for NCD prevention, and control, and little activity/experience to date in this area. There is little experience within the MOH and few programs or activities whose objective is to address the rising prevalence of NCD and injuries. Nor is there a structure with responsible staff around which to organize such activities in an integrated, cohesive manner. Currently the NGO partner – Heartfile – has responsibility to implement this plan. It is important to strengthen this public private arrangement where the private sector takes a role in National Programs. However at the same time it is also important to enhance the capacity of the Ministry in this programmatic area and to develop infrastructure, technical and administrative ability in this area.

Lack of clearly delineated public private arrangements is an impediment to the implementation of NAP. The NAP includes an action agenda with specific recommended activities for addressing the growing NCD health problem. The approved project document (the PC 1), which outlines activities and their approved budgets for the 1st phase of implementation of NAP gives Heartfile the lead role in implementation and has clearly specified the roles and responsibilities of each of the three partners.[27] However, absence of a conducive legislative and overarching policy environment for public-private interface arrangements is a barrier to its implementation. There is therefore the need to encourage and assist the development of policy and legislative frameworks shaping public-private partnerships within the country.

Sustainable financing is necessary to implement the NAP. The amount of financing available will determine how much of the Plan can be implemented and how quickly. Activities defined within the Plan have not clearly alluded to a timeline.

Capacity (human resources / skills development, infrastructure) needs strengthening at all levels (federal, provincial, district). The emerging NCD, mental health and injury issues require public health training to adequately address their prevention and control. The long lag-time for the development of many of these problems means that the focus must be on enabling preventive behaviors with a focus on populations and communities rather than on individuals. The NCD field requires an entirely different set of skills and knowledge compared to prevention and control of communicable diseases.

Hospital reporting is not uniform and is based on outdated coding schemes. There is no standardized reporting system that provides information about morbidity or mortality. Several

[27] Ministry of Health. Planning Commission (Health) PC-1: National Action Plan for Prevention and Control of Non-Communicable Diseases and Health Promotion in Pakistan, F.NO.25-21/2003-Planning. Islamabad, Pakistan: Government of Pakistan, 2003.

hospitals visited are each developing their own reporting systems to address their own management needs. The primary coding scheme used is ICD-8. Most countries updated to ICD-9 in the late 1980s, and are now using ICD-10, introduced in the late-90s.

3.7 Recommendations

Implement the NCD National Action Plan. The NAP is a comprehensive document with an action agenda for each of the targeted NCD and risk factors. However, this comprehensive plan cannot be implemented overnight. Priorities are defined in the NAP and a phased approach to rolling them out should be agreed upon. Roles and responsibilities for carrying out the priority actions will need to be defined. Broader dissemination of the document and discussion of how to implement the action agenda could be accomplished through a series of consultation meetings with provinces and districts. A summary document targeted to high-level decision makers would also be helpful. Potentially, surveillance could be used as an entry point to enhance collaboration across all levels (federal, provincial, district). The timing is good, as the pilot population-based risk factor survey will soon be expanded for national implementation.

Clearly delineated roles and responsibilities across public/private partners. NAP is being implemented through a novel public-private arrangement. However there is need for greater policy support of this implementation design; the terms of reference and the structural and procedural parameters of such an arrangement should be strengthened. Roles and responsibilities of partners need to be well-defined.

Polices, priorities, roles and resources allocations need to be clearly demarcated at the three levels of government with regard to the implementation of the NAP and its linkages with services at these levels. In particular, there is a need to develop a surveillance coordinating mechanism which has both the mandate and the capability of collecting, interpreting and utilizing the data for decision making at each of these levels. A mechanism for periodically bringing partners together to address new issues and tasks as they arise could help maintain momentum and energy. In the public sector, NCD surveillance units should be established at all provincial departments of health and in key districts with appropriate coordination and interface between all levels. Ideally risk factor surveillance would have central oversight at the federal level to help ensure data consistency and quality.

Assure completion of national, population-based risk factor survey and transition to an ongoing surveillance system. An evaluation of the risk factor survey pilot conducted in Rawalpindi District is planned and improvements will be made prior to national data collection. A budget has been allocated for the expansion of the pilot to national surveillance implementation. Once the first national risk factor survey has been completed, it is important to already have in place the planning and budget for a repeated cycle of national data collection.

Improve the technical quality of data produced by assessing data for completeness, timeliness and accuracy, and assure its utilization. Once surveillance data collection begins, the quality of the data will need to be assessed and reporting delays reduced. Technology can help incorporate quality checks and improve the timeliness of the data. Guidelines should be established to ensure consistent, science-based surveillance across data collection cycles and across participating provinces and districts. Finally, data collected must be used for program and policy development and evaluation.

Strengthen capacity to plan, implement, and evaluate surveillance, research, and interventions through the development and implementation of comprehensive public health

NCD prevention and control training package. A continuous education system to strengthen data collection, analysis, interpretation, and reporting; and capacity to translate data into public health action to prevent chronic diseases is necessary. Such a system would support the training of professionals to perform specialized surveillance functions (e.g., data coders and information technology specialists), and would consist of a package of training programs designed to enhance NCD prevention and control. Traditional infectious disease and clinical training are not sufficient because the NCD field requires a paradigm shift from outbreaks to prevention, and public health solutions require the involvement of multiple sectors covering psychological, social, political, and environmental dimensions. Public health partners have begun implementing courses such as the WHO/CDC Evidence-Based Public Health: A Course in Chronic Disease Prevention, which can be incorporated into the training package.

Involve the use of sample vital registration and sentinel sites to enhance chronic disease prevention and control activities. A sample vital registration system would be very useful for monitoring NCD trends and the impact of interventions. Such a system is discussed in greater detail and recommended for maternal and infant mortality surveillance in Chapter 2. Injury priorities—road traffic crashes and burns—can be addressed through sentinel site surveillance. This was identified as priority in the August 2004 consultation meeting on NCD surveillance.

Improve hospital data collection and use. Begin strengthening hospital data collection by focusing first on hospitals with stronger infrastructure, and then expand to other hospitals over time. Update hospital coding schemes from ICD-8 to ICD-10. Develop a standardized hospital reporting form to be submitted to a central location for oversight. Keep reporting system simple (as few fields as possible). Employ hospital health statistics and information technology staff to advance record keeping and reporting. Identify federal incentives for physician compliance in the accurate reporting/coding of death and diseases.

Replicate the Karachi cancer registry protocol in other sites and link registries to a national system. The Karachi cancer registry is the only registry in Pakistan that conforms to international standards. As recommended in the NAP, these standards should be replicated in a defined number of sites that receive sustainable support to provide good, continuous data on representative populations.

Consider working with development partner to obtain resources for NCD surveillance, prevention, and control. There is a need to garner greater support for the implementation of the NAP through the involvement of bilateral and/or multilateral agencies. This will enable strengthening of capacity on one hand and on the other hand will give visibility to the program. Emphasis should be placed on training, improving surveillance and data collection activities, implementing effective programs, and producing scientific publications.

CHAPTER 4: NEXT STEPS – TACKLING THE MAJOR ISSUES

4.1 Major Public Health Surveillance Issues in Pakistan

The assessment presents strengths, gaps, and recommendations for each of the three major areas of public health surveillance: communicable diseases, vital registration, and non-communicable diseases. There are many recommendations for closing gaps and strengthening these areas. This final chapter summarizes the key steps the GOP should consider to assure that an effective and comprehensive public health surveillance system is implemented. With the exception of the laboratory network, the major issues summarized in Box 13 cut across all three areas of surveillance and it is important to take steps to develop or strengthen each one of these. Addressing these issues is essential to implement the six key elements of surveillance: (i) detection and notification; (ii) investigation and confirmation; (iii) data collection; (iv) data analysis; (v) feedback and dissemination; and (vi) response (Box 1, p. 13). A suggested minimum surveillance package is summarized in Box 14 at the end of this chapter.

BOX 13. Major issues for effective public health surveillance in Pakistan

1. Functional surveillance structure
2. Legal framework
3. Human resources - training/capacity building
4. Definitions, guidelines, instruments, indicators
5. Modern information and communication systems
6. Laboratory network

The public health surveillance system in Pakistan is currently very limited. Its development is somewhat unusual compared to other developing countries because an NCD NAP has been elaborated and a BRF surveillance survey is currently being implemented. In most countries, NCD surveillance develops after vital registration and communicable disease surveillance. The NCD efforts begun via the public-private partnership should be supported and nurtured. However, clearly the absence of effective communicable disease surveillance and vital registration are major public health gaps, and steps to redress these gaps are urgently needed.

An NAP for Public Health Surveillance is required to identify realistic and measurable goals for each of the major issues in Box 13. Steps to address these issues should be taken in tandem as all are needed for a functioning system. The NAP should build on and improve what is already established and address gaps that have been identified by this assessment. The communicable disease surveillance systems that currently exist should be strengthened within the context of a new, discrete surveillance unit, and the diseases under surveillance slowly expanded. At this point, the only system that works seamlessly is AFP/polio. The AFP/polio system will not continue to receive development partner support forever, and its transition into a new, government-financed surveillance unit should be a fundamental part of the NAP. The structures and human resources established by the AFP/polio system should form the basis for expanding to other notifiable diseases. Tentative steps have been taken with measles and neonatal tetanus and they require the full support of the government and its development partners. The other systems that already exist (EPI, TB, HIV/AIDS, malaria and DEWS) should also be integrated within the new surveillance unit. Functional integration is particularly important at the district level. The diseases prioritized under DEWS should be reconsidered and efforts made to develop good surveillance and disease control activities for a smaller number of priority diseases initially. Once the initial efforts are successfully implemented the number of diseases under surveillance can be expanded.

Vital statistics effectively do not exist in Pakistan. No reliable birth and death statistics, required by health planners and policy makers, are available at the national and provincial level except for infant mortality from periodic surveys. While a SAVVY system is highly recommended to

quickly address this gap, there happens to be a once in a lifetime opportunity in Pakistan at this moment to rapidly improve vital registration. The country's need to register its citizens has impelled NADRA to develop birth and death registration software that was being piloted at the time of this assessment. The window of opportunity to work with NADRA and implement new birth and death certificates that capture information useful for health planners should be capitalized on immediately, or the window of opportunity will close. Once a system is established, the costs required to modify it may be prohibitive.

4.2 Key steps to establishing an effective public health surveillance system in Pakistan

Step 1: Establish a discrete surveillance unit with effective leadership and staffing at each of the administrative levels that includes sub-units for communicable diseases, vital registration and NCD.

Step 1a: Establish a communicable disease unit that incorporates AFP/polio surveillance and aspects of DEWS, and includes focal points for TB and HIV/AIDS surveillance.
Based on the findings of this assessment, the only truly functioning surveillance system is the AFP/polio system. The AFP/surveillance system has already created an effective structure at all administrative levels that includes all of the elements of surveillance. This structure should be used by the communicable disease unit as the foundation for expanding mandatory disease notification and surveillance to other diseases. The proposal for an NHIRC that includes a separate surveillance unit that would function under the NIH may be an acceptable way to proceed. A DEWS cell is already functioning under the NIH and should also be incorporated into this new unit. The new unit should focus on developing surveillance for a very short list of the priority diseases in addition to polio, TB and HIV. Given the tenuous situation of surveillance there should be no more than 5 new notifiable diseases initially (including measles and neonatal tetanus since efforts with these have already begun). Without a defined structure with leadership to take responsibility for public health surveillance, no other step will serve much of a purpose. The AFP/polio surveillance officers trained by the WHO in the past several years could serve as the backbone of the new structure. The focal points should collaborate with the NIH for laboratory systems development, training and capacity-building units and informatics support unit.

Step 1b: Establish a vital registration unit or focal point. Vital registration ideally should be incorporated within the surveillance unit or function as a separate parallel unit within the same structure (e.g., NHIRC). It should have its own staff. The top priorities for this unit would be (i) to work with NADRA on implementing a vital registration system that includes new birth and death certificates that provide useful health information; and (ii) to implement a SAVVY system of demographic and mortality surveillance.

Step 1c: Establish a non-communicable disease surveillance sub-unit or focal point. NCD/BRF surveillance is already underway in Pakistan and an NAP based on a private-public partnership exists. A sub-unit or focal point within the surveillance should be established to coordinate government activities in the context of the NAP and improve coordination with other partners.

Step 2: Develop a legal framework that defines roles and responsibilities for routine mandatory disease notification and public health emergencies at each administrative level.
This process could start with a review of laws related to public health surveillance and public health emergencies in other countries particularly those that are similar to Pakistan. A legal framework defining roles and responsibilities at each administrative level, as well as for health

providers in all sectors, will facilitate the development of public health surveillance. Since no legal framework for mandatory disease notification exists it will need to be created. A legal basis for vital registration already exists. However, it should be updated to take into account new developments.

Step 3: National and provincial surveillance cells develop (i) training for human resources; (ii) guidelines and other instruments for surveillance; (iii) software for reporting; and (iv) methods for dissemination and response.

Step 3a: Develop a training plan to improve capacity in epidemiology, public health surveillance and response, public health laboratories, and information systems for surveillance. This should be one of the first tasks of the national and provincial surveillance units. An FELTP is an essential component of such a training system and could initially train from 10-15 epidemiologists annually. The FELTP would be implemented in conjunction with CDC, USAID and the WHO. Simultaneously, training plans defining methods and tools need to be developed for the large number of provincial and district level health workers and laboratory staff who will participate in surveillance activities. The guidelines and other training tools developed by the WHO and the CDC for the Integrated Disease Surveillance and Response (IDSR) program may be used as templates for this training plan. The training tools and methods should incorporate the existing good training practices from the AFP/Polio surveillance, DEWS, and HMIS programs. Based on experiences from other countries, special trainers could be incorporated into the surveillance structure at the provincial level, and initially in some of the districts. These trainers would then be the foci for improving health workers' capacity and would serve as multipliers for training on a variety of important aspects of surveillance, epidemiology, epidemic outbreak and control, etc. Eventually all districts should have a trainer to multiply public health training. Likewise a plan to train public health laboratory staff and to assure quality assurance/quality control of laboratories at all levels will need to be developed.

Step 3b: Review and update current definitions, guidelines, instruments and indicators for surveillance of priority diseases with an emphasis on integrating existing reporting, feedback, and response activities. The national unit is responsible for developing standardized disease definitions and guidelines for surveillance of each notifiable disease including data collection, case investigation and confirmation, case management, and response required for prevention and control. The DEWS program has already developed definitions and case management guidelines for several diseases. Instrument for data collection are required. An objective of integration is to reduce demands on district and local staff. The national unit will be responsible for supervising provincial units and will require indicators to monitor performance. Indicators for AFP/polio surveillance have been established and should serve as a model for other diseases. The WHO has developed such indicators that could be adapted to the context in Pakistan. Likewise, for vital registration, the key instruments required are updated birth and death certificates. The vital registration system will need indicators to monitor its performance particularly as related to coverage, quality of information and utilization for improving maternal and child health outcomes.

Step 3c: Develop and implement disease software to facilitate timely reporting of priority diseases and vital statistics. The national unit would be responsible for developing notifiable disease surveillance software. This should initially be implemented in provinces and key districts. With time the system would be expanded to all districts and in larger districts to the sub-district level. Ultimately, this software would be linked to the public health laboratory network to permit easy confirmation of cases as well as rapid identification of new cases.

Software for vital registration has already been developed by NADRA. However, it will need to be updated once new birth and death certificates are developed by the vital registration unit.

Step 3d: Develop and implement methods for dissemination of information and feedback. An effective communication system is important to disseminate timely information, both routine and to alert public health staff of potential problems. AFP/polio, EPI, and DEWS systems all publish and disseminate a variety of reports. These should be integrated for more efficient transmission of information to districts and local staff. Rapid communication can be facilitated by developing accessibility to information via the internet.

Step 4: Establish a Public Health Laboratory Network. A national reference laboratory already exists. A focal point must be identified to coordinate with the newly established surveillance unit. More than one focal point may become necessary as the number of diseases under surveillance slowly expands. Provincial reference laboratories must also be identified pending an assessment of needs based on priority diseases and the mapping of potential laboratories. This will be the basis for a public health laboratory network. A much better assessment will be required to identify exactly what is needed to modernize laboratories and make them adequate for the needs of public health surveillance. Specimen transport systems already established for AFP/polio should be expanded to other priority diseases. The public health laboratory network will require a system of performance monitoring based on indicators related to quality of services. Quality assurance and bio-safety are issues that should begin to be addressed. Eventually, the network would be expanded to the sub-provincial level, depending on needs and financing.

Collaboration – an essential ingredient for successful public health surveillance. Public health surveillance requires collaboration among a wide variety of stakeholders for its success. Ideally these stakeholders should be represented as consensus is developed for the NAP. Provincial and district departments of health will play an indispensable role in case identification and disease and epidemic control. Timely identification of notifiable diseases requires the participation of all health providers in the surveillance system including LHWs, and primary care and hospital providers in both the private and public sectors. Birth and death registration requires collaboration with union councils. Academic and other training institutions will also be indispensable for capacity building in epidemiology, data analysis and interpretation, biosafety, utilization of information for planning and policy development, and a host of other areas in public health. Cross-sectoral and cross-agency collaboration may be achieved by instituting surveillance committees at the national, provincial and some districts levels with representation from key gatherers and users of morbidity and mortality information. At the national level, this committee may have representation from key donors and technical partners also.

BOX 14. Minimum package for surveillance – next five years

Diseases defined as the top 15 priorities during a workshop in February 2005:

- AFP/polio – already a gold standard
- HIV/AIDS, tuberculosis, malaria – surveillance established; continue improving
- Measles, neonatal tetanus, cholera, CCRF, rabies – scale up and intensify activities immediately with a long-term goal of elimination
- Typhoid, meningitis, pertussis, hepatitis, diarrhea – develop in second stage using sentinel surveillance for hepatitis and diarrhea

	Structure / Staff / Training	Laboratory	Information and communication systems
National	National surveillance cell established and financed by GOP with three units: i) communicable diseases, ii) vital registration, and iii) NCD and risk factors. Staff: lead epidemiologist; focal points for each unit and for specific communicable diseases under surveillance; training coordinator; IT staff. Legal framework for surveillance and response, mandatory reporting/vital registration elaborated/updated. A body with representatives of all stakeholders involved in public health surveillance, including communities and the private sector is established and engaged in the development of the surveillance system. **COMMUNICABLE DISEASES** Structure and functions of surveillance unit modeled on AFP/polio surveillance and based on lessons learned. AFP/polio surveillance system absorbed by national surveillance cell – phased approach. Diseases under surveillance slowly expanded; DEWS evaluated and operationalized based on lessons learned from AFP/polio. Guidelines developed for integrated, mandatory disease reporting: definition, reporting, response, confirmation, and follow-up for each disease under	National laboratory to take responsibility of the network and provide oversight. Office of Quality Assurance National reference laboratory for each of the diseases under surveillance. Staff: focal point to coordinate with national surveillance cell; staff trained for laboratory confirmation of each disease under surveillance; chief of quality assurance. Specimen transport systems set up for each disease under surveillance. Quality assurance guidelines available particularly as related to the diseases under surveillance. Public health training network includes laboratory components. Resources for supervision/quality assurance of provincial laboratories. Legal framework for laboratories including personnel standards.	Development and implementation of standardized software for mandatory disease reporting. Effective communication between the national reference laboratory and national surveillance cell. Quarterly national bulletins summarizing surveillance data implemented. Development of web-based reporting system. NADRA birth and death registration software modified to incorporate improved birth and death certificate information; SAVVY system established and providing information. First National BRF survey completed and results disseminated; steps taken to systematize follow-up surveys. Standardized hospital reporting system developed that contributes to all three areas of public health surveillance.

	surveillance. Monitoring indicators developed for integrated disease surveillance and response. Resources available for adequate supervision of provincial cells. Public health training network envisioned, plan developed, and implementation begun. FELTP established. **VITAL REGISTRATION** Team assigned to work with NADRA on lessons learned from vital registration pilot. Improved birth and death certificates developed and implemented with NADRA. Indicators for monitoring quality and coverage of VR developed. SAVVY system implemented. **NON-COMMUNICABLE DISEASES AND RISK FACTORS** Staff and resources assigned to work on NCD/BRF surveillance and implementation of NAP. Training in NCD/BRF prevention underway.		
Provincial	Provincial surveillance cell established and financed with units for communicable diseases and vital registration. Staff: Lead epidemiologist; focal points for diseases under surveillance, VR and NCD; IT staff. Resources for supervision of district cells. **COMMUNICABLE DISEASES** National guidelines for priority diseases being implemented. AFP/polio surveillance absorbed by district cell via	Provincial reference laboratories selected and staff trained. Quality assurance systems developed.	Standardized software implemented in all provinces. Hospitals and private sector incorporated in reporting systems (as in AFP/polio). Effective communication channels with national and district cells for each disease under surveillance. Provinces receiving data on vital statistics from newly implemented VR system.

	phased approach. Epidemic preparedness and response plan developed. Surveillance trainer in each province to build capacity. Training programs established **VITAL REGISTRATION** VR focal point is aggregating VR data; monitoring coverage and quality, analyzing VR data. Plan developed to extend coverage to 100% of the population. **NON-COMMUNICABLE DISEASES AND RISK FACTORS** NCD focal point is using BRF survey findings to address NCDs and is implementing NAP.		
District	District surveillance cell established and financed. Staff: Surveillance officer; staff size depends on size of district. VR data being collected from union councils, aggregated and analyzed. **NON-COMMUNICABLE DISEASES AND RISK FACTORS** NCD/BRF prevention activities are taking place.	Laboratory network developed for each disease under surveillance; laboratories mapped to districts so that each district knows what laboratory to use for diseases under surveillance.	Standardized software implemented in most districts. Hospitals incorporated in notifiable disease reporting system (as in AFP/polio). Community-based information incorporated in notifiable disease reporting system (as in AFP/polio) 80% of districts have implemented computerized VR system

ANNEX 1

RESULTS OF ANALYSIS USING WHO INSTRUMENT

Methodology

Selection of Sites

Considering the public health infrastructure and administrative organization, a convenience sampling was done for the selection of sites for assessment. All four provinces and Islamabad were visited. Visits included the Provincial Head quarters, the District Head quarters, Tehsil Head quarters, private hospitals, rural health centers, basic health centers, and laboratories within hospitals and health centers.

Data Collection Tools

The data collection was through interviews, direct observation and document reviews. Policy makers and technical staff were interviewed at different levels of the health system. The following tools were used during the review mission:

- Strategic Questionnaire: Central and provincial levels.
- Daily SWOT analysis tool
- Intermediate Questionnaire: Provincial and District level (for vertical programs at provincial and district levels)
- Health facility Questionnaire
- Laboratory assessment Tool
- Checklist of documents to be observed (Intermediate and Health facility)

All the data collection forms were in English. However, the national and local partners translated and assisted in data collection when necessary.

Adaptation and Field Testing of Questionnaires

The WHO questionnaires for assessment of communicable disease surveillance and response were used after adaptation to the Pakistan context, subsequent to field-testing in Islamabad. The data collection forms were modified based on the results of the pre-test.

Field Assessment

Two teams were constituted, composed of national and international expert. Each team went to two of the provinces and split there to cover different institutions and programs. The decision maker and technical persons responsible for surveillance at the level were interviewed after explaining the aims of the assessment and the expected outcome of the assessment. The following main areas of surveillance were assessed:

- **Structure**: The organization of the surveillance systems, epidemic preparedness, and response was assessed at the central, regional, district, and health facility levels. The relationship between the different levels was described and discussed as well as the resources (input) that were used for their activities. Further, the regulations governing surveillance, and the priority diseases under surveillance.

- **Process**: The surveillance, epidemic preparedness and response procedures were assessed. The flow of information was described and its use for public health action assessed. The following activities in the surveillance process were assessed: case detection, registration, case confirmation, data analysis and reporting, feedback, supervision, outbreak investigation, epidemic preparedness and response at all levels of the health system. The team has also evaluated unnecessary duplications in the implementation of these functions.

- **Output**: The assessment team evaluated the effectiveness and efficiency of the system for different diseases and at different levels, concerning the monitoring of communicable diseases for prevention and control. The assessment examined outputs from the different surveillance systems at different levels. Outputs reviewed included weekly, monthly, quarterly as well as annual reports.

- The system attributes were considered and, where possible, assessed. The following system attributes were take into account:

    - Completeness
    - Timeliness
    - Flexibility

- **Capacity**: The capacity of the national surveillance system is determined by the ability of the system to adequately monitor priority health events. The core activities and support functions of the surveillance systems were assessed at all levels of the health care system. In assessing the capacity, the teams looked into the availability and number of trained health staff working on communicable disease surveillance at each level, and the type and number of training received and conducted at different level of the system, pre- and post-graduate. In addition, the availability of a budget for surveillance and epidemic preparedness and response was verified. An inventory was done of material resources for surveillance including communication equipment, transport facility and logistics, emergency stocks of drugs and medical supplies for epidemics and data management. Interviews with the public health schools were separately carried out to understand the human resource development capacities.

- **Integration**: Integration refers to co-coordinating all surveillance activities and support functions common to all control programs (e.g., data collection, training, and supervision) while leaving follow-up actions to the different specific intervention programs. Many functions in the surveillance of most communicable disease are similar and as such can offer opportunities for integration. Appropriate integration within the national surveillance system can improve system performance, reduce costs, increase efficiency, and promote sustainability of the system. During the assessment, opportunities for integration and co-ordination were explored and described. Opportunities for integration,

synergy, and co-ordination where identified for the priority diseases under surveillance and for the different core and support functions.

- **Laboratory**: Laboratory services are essential to disease surveillance and need to be integrated into the national disease prevention and control infrastructure and epidemiological program. The role of the laboratory in providing rapid diagnosis of etiologic agents provides support for most surveillance systems requiring confirmation of clinical diagnosis for endemic and epidemic-prone communicable diseases in order to guide an effective public health response while using the minimum amount of resources. In addition, monitoring of anti-microbial susceptibility is completely laboratory based, and this role is critical in rational treatment and control of diseases. Therefore, assessment of national laboratory diagnostic capacity as part of the overall assessment of national surveillance and epidemic preparedness and response was one of the central components of the in-depth review mission to Pakistan. Main points of the laboratory assessment were: The structure, capacity, and linkage of laboratory services to the surveillance system, the contribution, and role of laboratory services in communicable disease surveillance and epidemic response. In addition, the possibility for collection and transportation of specimens for referral and the availability of reagents, chemicals, equipment, and skilled human resources were evaluated. Quality control and quality assurance issues, training, standard operating procedures (SOP) for bio-safety, data management, were also reviewed as well as the preparedness and experience of selected laboratories in participation in outbreak investigations.

- Special attention was given to some issues identified as challenges to the health system such as cross-border surveillance, the role of the private sector, the existing systems like HMIS (Health Management Information System) and DEWS (Disease early warning system) etc.

- **Data Analysis**

1. Each team carried out a daily qualitative analysis of the assessment, based on an analysis of the strengths, weaknesses, opportunities, and threats observed, and the analysis of the decision maker's questionnaire. Additional the review team solicited informal feedback on problems and issues identified by workers themselves regarding surveillance. This complemented the quantitative data from the questionnaires (from the laboratories and the health facilities), which were entered and analyzed using the EPI-Info 6 software.

Briefing of Authorities and Feedback

2. Internal reviewers discussed the preliminary results of review. Briefings on the main findings of the review together with some proposed recommendations were presented to senior health authorities. Suggestions raised during the briefing presentation were incorporated in the final report. The next steps and timelines for implementation were agreed upon during the briefing.

Findings of Assessment

Table 3: Institutions Visited

Province		Intermediate level, sites visited		Health facility level, sites visited				
	National	PHQ	DHQ	THQ	RHC	BHU	Private	Total
Islamabad	1			2	0	0	0	3
Punaise		1	1	1	1	0	0	4
NWFP		1	1	0	1	1	0	4
Sind		1	1	1	1	1	0	5
Balochistan		1	1	1	0	1	1	5
Total	1	4	4	5	3	3	1	21

Table 4: Laboratories Visited

Province	National	FC	DHQ	RHC	Private	Total
Islamabad	1	1			1	3
Punjan		1	2	2		5
NWFP		1	1	1		3
Sindh		3	1			4
Balochistan		1			1	2
Total	1	7	4	3	2	17

Table 5: Interviews Carried Out

Level where interview was done	Persons interviewed	Type of questionnaire	Number of questionnaires
NIH	Program manager	Central	3
Province	Program managers	Intermediate	11
District	Program managers	Intermediate	5
Health facilities/ Hospitals	Medical officer	Health Facility	12
Total			31

3. The quantitative analysis was done for the different levels interviewed. At the province level individual interviews were done with the different programs (HIV/Aids, EPI, HMIS, TB and Malaria), at the central level only HMIS, EPI and DEWS were individually interviewed. Since at the provincial level and central level the individual programs were interviewed some of the analysis was then restricted to the district level. The results are presented in the tables in the Annex. Results of the quantitative analysis are stated below the qualitative analysis. The quantitative analysis of the laboratory assessment is stated in the part of the laboratory function with the table of the results in the annex. Further, the global indicators were derived from the analysis and the table with the results of the indicators is attached as an additional annex.

Legal and Policy Framework for Surveillance

Strengths and Achievements A legal and policy framework is important to guide surveillance and response in Pakistan. This framework should indicate who should report and what should be reported. Such a law could provide a basis for soliciting participation from the private sector, which provides health services to approximately 70% of the population. Currently in Pakistan, there is awareness of the need for such guidance at all levels, and this is a stated priority. Ongoing health sector reforms provide an opportunity to review surveillance policies. In addition, WHO requires countries to review surveillance capacity and regulations for compliance with the revised International Health Regulations (IHR). While there are examples of draft regulation for the private sector in some provinces such as Balochistan this ordinance would regulate licensure, minimum standards and continuing accreditation. It does not address the issue of public health surveillance, disease reporting, or health information reporting.	
Problems and Challenges	**Solutions and Actions Needed**
No legal and policy framework in Pakistan that addresses surveillance either in the public or private sector. Enforcement of such a law may be a challenge, especially if viewed as punitive.	Elaboration of a national policy for public health surveillance and a non-punitive legal framework to support it including the mandatory notification of a minimum number of diseases or events of public health importance and of national and international concern, which should be mandatory also for private clinics. A legal framework governing laboratory practice is also needed. Various models of Public Health Acts could be considered in the development of such a law. The legal responsibilities of each level should be clearly delineated.

4. Organization of Surveillance

Strengths and Achievements There is a primary health care structure in place, organized into the Federal, provincial, district and health facility levels. The HMIS covers 117 out of 120 districts, vertical programs such as TB, Polio, EPI, HIV/AIDS, Malaria, and LHW are in place. Several institutions are present at different levels that participate in surveillance. Some programs have a very clear organization and structures and with good surveillance systems in place, such as Polio. In some provinces such as Sindh, there are plans for a provincial unit. There is a felt need for useful disease data by decision makers and for oversight of their catchment area.	
Problems and Challenges	**Solutions and Actions Needed**
Absence of a single surveillance unit with responsibility for disease detection, prevention and control. Multiple stakeholders heavily investing only in the systems they have responsibility for. Agendas are often donor driven.	Establish strong central technical and administrative leadership and direction through an Epidemiology and Surveillance unit. Similar units should

Devolution increases district responsibility for activities in health but reduces standardization and district accountability to provinces. Roles and responsibilities at different levels not clearly defined. No clear operating procedures. Fragmented, parallel systems with little integration and co-ordination at all levels. Collaboration is minimal with few horizontal links and strong vertical systems. An AFP surveillance structure has been established that is very successful. However it dominates surveillance in the country, is development partner driven with considerable resources that are unlikely to be sustainable by the country. A challenge will be to integrate programs functionally for surveillance while maintaining their success and focus and ensuring achievement of their objectives. About 70% of the population utilizes the private sector, as their first level of care facility. However, the private sector is not legally bound to report communicable diseases. The only surveillance system that has taken it into account is the AFP/polio system.	be created at the provincial and district levels to be responsible for surveillance and outbreak activities. Establish similar co-ordination with laboratory and training.

5. Diseases Under Surveillance

Strengths and Achievements There is a fairly concise list of reportable diseases (17-18 conditions) within the HMIS. Many infectious disease priorities are included, with a consensus on the major burden of disease. Standard case definitions are available for some systems such as DEWS, AFP/polio at the federal level. Some provinces have appropriately added diseases to the list that are priorities in their areas e.g. Balochistan added rabies, leishmaniasis and CCHF to the HMIS list.	
Problems and Challenges	**Solutions and Actions Needed**
A disease surveillance prioritization has not been carried out for a decade. With a few exceptions, the conditions under surveillance (HMIS, DEWS) lack specificity and case definitions are poorly known and rarely applied, minimizing utility of any collected data. There is insufficient infrastructure to assure application of common case definitions, and poor laboratory diagnostic capacity limits ability to confirm cases.	Prioritization of diseases involving various expertise, levels, and building consensus. WHO has a draft guideline on prioritization. Develop a common list of reportable conditions and develop epidemiological and laboratory capacity for priority diseases. List of diseases under surveillance should be slowly expanded as capacity for surveillance and response improves. Revise, update and standardize tools.

6. The HMIS list was available at all visited Districts, and health facilities. It was not available at the hospitals or private clinics, or at the other programs at the provincial level. The Dews and EPI lists were available at the intermediate level. At the health facility level DEWS was available at 4 of the 6 visited facilities and EPI at 2. At the hospitals one of the 5 visited had the list for EPI diseases. The private hospital did not have any list. Further at one hospital they are reporting quarterly diseases similar to the HMIS list.

7. Immediate reporting for AFP is done from all institutions visited, except the private hospital. Other immediate reporting is not systematic, but about half of the institutions say that unusual events would be immediately notified. Some stated that CCHF and cluster of diseases were also immediately notified.

8. Case definitions for AFP were available in 75% of the facilities visited; all but the private hospital reported immediately AFP cases. Weekly zero reporting is done by all health facilities and the hospitals are visited by the surveillance officer to actively collect the information.

9. Case definitions for other diseases are not readily available. Only one of the 12 visited facilities had case definition for measles, 5 for hepatitis and 3 for Tuberculosis.

10. **Inter-Sectoral Collaboration**

Strengths and Achievements Although inter-sectoral co-ordination is not optimal, there are good examples of this illustrated by the containment of the CCHF, cholera and leishmaniasis outbreaks in Sindh and Balochistan (e.g. coordination with agriculture dept. in Balochistan for CCHF control). Other examples include AFP and malaria, with good private sector collaboration. There is awareness in the public sector of the need for inter-sectoral collaboration and a strong desire to build systems which include data from private sector sources. A high proportion of population is served by private sector, and although they might need incentives to participate in public health surveillance, the private sector seems willing to collaborate and has done so for AFP/polio. The AFP/polio surveillance system has systematically involved the private sector in its active surveillance program in every district. Private sector involvement has been started for HIV/AIDS and Malaria, but for the other programs the private sector is not yet involved.	
Problems and Challenges	**Solutions and Actions Needed**
There is weak inter-sectoral collaboration with no clear vision on sectoral role. No clear guidelines or SOPs for private or other sectoral collaboration The involvement of the private sector in surveillance is patchy with no systematic mechanism in place to involve them with the exception of AFP/polio. There is inadequate sharing of information with private sector, few incentives, and no requirements for private sector to collaborate. The challenge is that of changing behavior, instilling the importance of participating in public health surveillance, while increasing the workload of the private sector, without providing additional resources.	Clear vision and guidance on inter-sectoral collaboration, particularly with the private sector. A legislative framework might better guide this collaboration The public sector should seek participation of the private sector. Political will needs to be generated. Incentives such as training , meetings, regular feedback, recognition, and accountability need to be instituted. Incentives could also include private sector representation on surveillance committees and other key PH activities, as well as increasing participation of public sector in private health conventions

11. Health Sector Reforms

Strengths and Achievements The ongoing health sector reforms and devolution has drawn attention to health related issues in Pakistan, and some provinces such as Punjab and districts note increased resources and funds. Devolution is creating the opportunity for better defining roles and for increased health care financing. There is also the possibility to increase posts for epidemiologists at the lower levels and funds for initiating local action including outbreak response. Many development partner financed programs are in place, with health policy components that address surveillance.	
Problems and Challenges	**Solutions and Actions Needed**
The system for devolution is in place. However, roles and responsibilities at the provincial and district levels are still being clarified including accountability mechanisms.	Define roles and responsibilities of provincial and district levels.
Small percent of GNP attributed to health. There is a need for greater commitment to government financing. There is no dedicated budget line for surveillance. Rules of business not well defined or known.	Strengthen devolution process.

12. Cross-Border Surveillance and Collaboration

Strengths and Achievements Pakistan has long borders with neighboring countries with heavy migration on the western border. There is a collaborative mechanism through the SAC (South Asia Committee). Pakistan collaborates with Afghanistan and Iran on Polio and Malaria. Otherwise there are no cross border activities. There are some diseases like AFP where the NIH laboratory receives specimens from Afghanistan. With the political situation with both India and Afghanistan changing there could be new opportunities for building regional capacity. In addition information is currently available on the web, through the WHO/CSR website, on various outbreaks in different countries that are of inter-national importance, creating an opportunity for discussions between countries.	
Problems and Challenges	**Solutions and Actions Needed**
No systematic mechanism in place to address cross border issues except for malaria. In addition to inter-country sharing of data, there is a need to share surveillance data between provinces and districts.	Develop systematic approach to cross-border surveillance and collaboration on priority disease. Organize inter-country meetings and inter-country networks, and
Political circumstances outside the health sector could limit collaboration.	involve neighboring districts/provinces in cross-border surveillance.
Challenges such as settling of cross-border disputes, and transparency of countries.	Develop formal mechanisms for better collaboration between districts and provinces.

One district out of three stated that there were involved in cross border meetings.

13. Data Collection

Strengths and Achievements

All locations visited were collecting data for the main surveillance systems – HMIS, vertical programs. Systems exist at grass-roots levels (LHW), staff is highly committed to data collection and staff is trained particularly on AFP/polio. Active surveillance is ongoing for AFP and Malaria. Standard registers and forms are available. There is clearly an opportunity to improve the system and create effective surveillance for priority diseases by building on what already exists particularly for AFP/polio surveillance.

Problems and Challenges	Solutions and Actions Needed
With the exception of some of the disease specific vertical programs the current surveillance systems do not adequately meet the principal attributes of effective surveillance (sensitivity, specificity, usefulness, timeliness, etc). There is no tradition of collection of useful, action-oriented data in Pakistan. The HMIS, while an important source of information for planning and management does not serve the surveillance needs for rapid detection and response. There is considerable duplication of forms causing inefficiency and an increased work load. There is no linkage between EPI and lab data collected	Overhauling the current surveillance system in a way that builds on the best elements and minimizes those that are not useful. Streamline forms and variables and train on data collection, tools. Need for joint meeting of programs to identify duplication such as forms, reduce overload of the system and compromising of data quality. Develop comprehensive epidemiological and laboratory data collection, analysis and use for priority health problems.

14. Data Management and Analysis

Strengths and Achievements Some useful tools are available (HMIS, AFP). Analysis is carried out for AFP. Computers are available at some district, provincial as well as national levels and there is an opportunity to initiate automated data management and analysis. Data are available through the current system for demonstration of analysis and use of data. Trained staff exists in some programs like Polio.	
Problems and Challenges	**Solutions and Actions Needed**
There is minimal use or analysis of current data particularly at the district and provincial levels. There is little analysis of submitted data to determine its accuracy. Rates and indices are not calculated and data are not interpreted for local use. There are no defined thresholds for many priority diseases and there is little capacity to do such analysis or interpret it. There is questionable validation processes for data and no timely action. Little concept of use of data with poor quality. There is no culture of evidence based decision making. Further analysis needs to be done during outbreaks and routine reports. There is a need for production and display of selected indicators, including completeness and timeliness of reporting (only exists for AFP/polio).	Institute systematic data analysis and develop standardized data management and analysis software to manage surveillance data with inbuilt automated analysis packages. Needs assessment, development of a training plan and applied training on standard approaches to data management, analysis and utilization.
There is a need to share resources in data management, including computers.	Improve quality and use of data
No system wide standard in terms of use of computers, lack of vision on informatics, no capacity to trouble shoot at different levels. Different computer programs and software used, with no standardization.	
Computers were only being used for data processing and not analysis.	

15. **Data Transmission**

Strengths and Achievements
The current system is quite simple, being mostly paper-based. Forms are completed and submitted. Most sites report submission levels >90 %. Computers are available and there is electronic transmission between province and central particularly for AFP and HMIS. Telephones are available at district to province at many sites, and data are currently being transferred at different levels. Internet support available at provincial level. There is increased awareness and demand for information technology, and the technology exists in many locations. There is an opportunity, with proper equipping and maintenance to increase the speed and reliability of surveillance data transfer. The current development of web-based system for HMIS at federal level could be further built upon.

Problems and Challenges	**Solutions and Actions Needed**
Current system does not take advantage of modern technology. Emails not used despite internet connection. Reporting mainly by post resulting in untimely reports. Manual and slow, from district. Some Tehsils visited reported only on AIDS and AFP. There is a tendency for acquired hardware to break down quickly and not be maintained Little training on data management, use of computers and the internet resources Masking of outbreaks by telephone reporting of individual cases, and no further analysis of data.	Electronic reporting from district to province to federal levels Explore alternatives ways to move computer-based data by e-mail or web. Training in information technology, computers and web-based reporting.

16. Computerized data were available at 3 (25%) of the visited health facilities and at all districts. One of the 5 districts received computerized data from the facility level. 7 of 11 facilities stated that they are informed or even don't receive salary if they are not sending the reports.

17. **Feedback and Supervision**

Strengths and Achievements Regular supervision for Polio, EPI, malaria and TB. Feedback is generally carried out and content reviewed for AFP, and for HMIS with limited application. Supervision culture exists. Capacity exists to develop bulletins and with in-service training, empowerment of programs, there is an opportunity to upgrade feedback. Regular meetings often held between levels, creating an opportunity for supportive supervision.	
Problems and Challenges	**Solutions and Actions Needed**
Feedback not functioning optimally. Often insufficient and delayed. Given within some programs and even then, not often to lower levels. No feedback to the private sector. No bulletins or systematic reports are produced. No standardized supervisory checklist. No supervisory timetables. Often inspection not supervision. Supervision is currently done by the programs individually and needs to be integrated. No availability of protocols and limited resources for feedback and supervision	Regular bulletins summarizing surveillance data should be instituted. Feedback should be directly relevant to users and shared. Feedback and supervision protocols and tools should be developed Institute biennial/annual meetings on epidemiological and surveillance issues with broad attendance by public health / surveillance personnel, laboratory personnel, academicians, etc.

18. Feedback is received by 2 of 3 districts for Polio and one of 3 from HMIS. Four of the facilities sending information are getting feedback for Polio, 2 of 5 are getting feedback of HMIS and 2 of 11 facilities for Tuberculosis. Supervision was received by 9 (82%) of the facilities.

19. **Epidemic Preparedness**

Strengths and Achievements Funds accessible for epidemic preparedness. DEWS has two mobile laboratories (Quetta and NIH) for response. Committees are created during outbreaks to monitor the institution of appropriate health measures. Balochistan has a standing epidemic cell with an epidemiologist, pathologist, and other key personnel that have responded to several outbreaks (CCHF, cholera, measles). Federal level has an epidemic investigation cell that can provide support during epidemics.	
Problems and Challenges	**Solutions and Actions Needed**
Epidemic preparedness is rudimentary and done with little co-ordination. There are no epidemic preparedness committees. Generally, adhoc teams constituted for epidemic preparedness. There is a lack of awareness of how EPR would fit into the system There are no designated staff or defined process. The laboratory is not implicated. Drugs often out of stock. No written guidelines or plans. No SOPs or guidelines.	Develop epidemic preparedness with creation of EPR committees, written EPR plans, stockpiling and monitoring, assignment of responsibilities, and guidelines. EPR should be an integral part of co-coordinated program activities.

20. **Rumor Verification**

Strengths and Achievements Provinces indicate that they closely monitor newspapers for reports of outbreaks that may not have been reported to them. Some rumors reported from communities, and the LHWs provide an opportunity to enhance this. The media could be a major source of outbreak information, given the otherwise weak state of routine surveillance data.	
Problems and Challenges	**Solutions and Actions Needed**
No systematic approach to rumor verification at all levels. Often no clear response to rumors or follow-up of reports	Rumor verification system should be established with dedicated staff and resources. The use of the media as a source and ally is important Education of media on surveillance outbreak investigation and response.

21. All districts and 7 of the provinces/province programs have a rumor verification system. While all of the province programs with a rumor verification system have focal point, this is true for 3 of the 5 district. A logbook for rumors is only used by 2 of the districts and by none of the province programs. An outbreak was found through this system in the last year in one province and in one district. All systems were referring to the newspapers, most also to community leaders and some to NGO's.

22. The systems were based mainly on newspaper or community leaders. At the health facility level 7 of 11 stated to have a rumor verification system and 5 of them stated to have a focal point. At three facilities a logbook for rumors was observed. And 3 of the facilities stated that they had found an outbreak through the system. The systems were based mainly on newspaper or community leaders.

23. **Outbreak Investigation and Response**

Strengths and Achievements

The DEWS was developed to assure prompt outbreak detection. This system has identified >200 outbreaks in the last few years. Epidemic Investigation Cells (EIC) are available in some areas (central level and Balochistan), along with funds for response. DHO focal points exist. There is support to EIC from the NIH. DEWS, AFP and LHWs are opportunities that could be built upon nationwide for early detection and rapid response to outbreaks. Most sites knew how to, and who to, request additional assistance. Rapid response takes place if outbreak identified and support requested. There is good inter-sectoral collaboration during outbreaks. The opportunity for development of a training program in outbreak investigation and management, and the availability of public health schools and institutes, and highly qualified personnel makes a strong foundation for building this capacity. In addition, for compliance with the revised International Health Regulations which requires that countries detect and respond to all public health emergencies of international concern, there would be a need to build these capacities. Response to cases of polio is very rapid – within 48 hours.

Problems and Challenges	Solutions and Actions Needed
No systematic way of recognizing, detecting or responding to outbreaks. DEWS requires only reporting of aberrancies and does not routinely collect data or reports. Charts are often not available. When available, they are not plotted or analyzed. Lack of systematic reporting and fragmented reports could mask big outbreaks. It is not fully functional and not widely used. Current outbreak responses are not optimally co-coordinated or investigated. (ex. no case control studies to identify risk factors). Even when big epidemics are identified (e.g. meningitis in Hyderabad) the response is inadequate. Although training was carried out in DEWS, training has not translated into implementation. There is a need to build DEWS into an alert and response system that is part of the national surveillance system with appropriate human resources, networks and logistics for rapid and effective control. Many institutions exist that can support this and devolution allows action to be taken at local levels. Response is basic and mostly vertical, with no institutionalization. Although Measles and NNT has been added to AFP surveillance, there is generally no response to these outbreaks. Reaction to Polio is often made in less than 48 hours, but not for measles. No written guidelines on outbreak investigations. No clear identification of rapid response teams.	Strengthen rumor verification and early warning and response system as part of the national surveillance system. The DEWS should be built upon and used. Institute appropriate training such as an FETP and career tracks for outbreak detection, preparedness and control. Identify rapid response team in every province and larger districts to assist with epidemic response and control.

24. Disease Monitoring and Control

Strengths and Achievements Disease monitoring is critical for control and exists within the vertical programs. The polio system has been well developed nation wide.	
Problems and Challenges	**Solutions and Actions Needed**
Whilst examples abound where disease monitoring leads to treatment and case management, few cases reported lead to thorough case investigation and implementation of standardized prevention and control measures (i.e. contact tracing, etc).	Develop standardized approach to disease monitoring and investigations, and guidelines for prevention and control activities.

25. Guidelines for infection control are available in 3 of the 12 facilities visited. 2 of 12 are using gloves. 3 of 12 facilities were using safety boxes for syringes and 5 of 8 had soap available.

26. At district level analysis is done in some of the programs. Only in three districts were the questions completed. Out of theses all did time analysis for Polio but only one for measles and TB. Attack rate was not calculated for any disease and the use of maps was done for Polio in two and for one in Hepatitis.

27. At the health facility level only two facilities (both public) were doing any type of analysis of data.

28. **Attributes of the System**

Strengths and Achievements The system has been flexible enough to allow additional diseases without major changes in time, human resources or finances (ex. hanging of reporting frequency in Balochistan during outbreaks to daily reporting. The polio system was found to be useful in achieving its eradication objectives, and DEWS was found to be simple to operate. Although variable, some data sets were of good quality. Ongoing monitoring would provide an opportunity to improve the attributes of the surveillance system.	
Problems and Challenges	**Solutions and Actions Needed**
Delays in timeliness of early warning information for rapid response	Operationalize a fast track system that immediately detects and responds to priority and emerging communicable disease threats
Whilst forms were filled completely, the case ascertainment is poor because of lack of diversity of data sources (i.e. private sector, in-patient facilities, etc).	
Data are not critically reviewed, and the validity and quality of data needs to be improved	Improve data quality and utilization
In terms of usefulness, data many data collected are not objective driven. Data is not used to inform evidence based decision making.	Institute a culture of data to inform decision making Train human resources in operating useful systems
Human and financial resources	

29. One district and one province program stated that they could change the list for reporting diseases. To change the frequency was possible in 4 of 5 districts and 3 of 11 province programs. The source of information was possible to change for all districts and 4 of the 11 interviewed provinces/province programs.

30. Standards, Guidelines and Tools

Strengths and Achievements There are guidelines for all the major vertical programs and the HMIS, as well as tools, including the DEWS chart in several localities. There is a toll-free number, known by all to call for Polio with clear guidance on when to use it. WHO manuals are used for Measles and NNT.	
Problems and Challenges	**Solutions and Actions Needed**
Although available in some sites, guidelines and tools are not being used at the lower levels, including standard case definitions, monitoring charts, etc. Some of the data collection and reporting instruments do not contain relevant sections. Ex. Lab confirmation and infection control are not included in the EPI forms. The content of the tools include only processes with little information on responses. In addition some tools are outdated and need to be updated and made more functional. Staff not sufficiently skilled to operate tools. There is little digitized mapping carried out.	Guidelines and tools need to be updated, and training widely carried out GIS development

31. Material Resources

Strengths and Achievements Material resources were mostly available at the provincial and district levels. Some locations had computers and all had supplies and medication.	
Problems and Challenges	**Solutions and Actions Needed**
Computers needed at federal, provincial, district at least. Equipment is poorly maintained and will deteriorate rapidly. Vertical programs with greater development partner support have more access to material resources but these are often used for that program only. Utilization of health facilities are related to drug availability, for which there are often shortages at the BHU level High performing persons in public sector are absorbed by NGOs and private sector.	Training, incentives for retention and budget line for maintenance of computers and other equipment. Greater integration of resources across disease control programs particularly at the district level.

32. All districts were equipped with cars a copy machine, had computers and telephone and three of the 5 had internet connection.

33. At the facility level it depended mainly on the size of the facility 67% had cars 42% had a copy machine, 33% had a computer and 67% a telephone. Internet connection was only available at the private hospital.

34. **Financial Resources**

Strengths and Achievements Many international partners have invested in Pakistan. There is an international interest in the country that drives health financing. Some provinces indicated that they were not constrained by their financial situation to expand activities.	
Problems and Challenges	**Solutions and Actions Needed**
Allocation of government resources to core programs and activities minimal. The devolution process has not fully clarified financial issues Some locations have significant financial and human resource constraints especially at the lower levels. Resources are not pooled to increase efficiency with resulting wastages.	Financial investment by government in surveillance and control of priority communicable diseases. Allocate a budget line for surveillance. Review and address gaps in the devolution process Prioritize resources and allocate based on equity Integrate as appropriate for more rational use of resources, reduced duplication, greater sustainability and improved efficiency.

35. **Communications Infrastructure**

Strengths and Achievements The communication networks and infrastructure is growing in Pakistan, and differing levels of technology are available at various levels. Some districts and all provinces have the ability to send information electronically and the capacity of building a more efficient data communication infrastructure.	
Problems and Challenges	**Solutions and Actions Needed**
Many sites do not have computers and very few have web access or e-mail capability below the provincial levels. Low computer literacy rate and poor knowledge of information technology.	The current paper based system, though simple, will need to be enhanced to move towards electronic data entry and transfer. Capacity building for use of information technology

36. **Human Resources**

Strengths and Achievements There is a large workforce in Pakistan, willing to contribute to disease surveillance and control. The devolution has resulted in posting of medical officers to the peripheral levels, including the BHU. Public health Institutes are available at all the provincial levels and at the central level. Training on disease specific monitoring and control is carried out by some training institutions. There is a potential for developing good training networks.	
Problems and Challenges	**Solutions and Actions Needed**
No comprehensive plan for workforce development, including FETP, other epidemiologic, surveillance, and lab training. There is limited technical capacity, with little upgrading of skills and competencies, and limited in-service training. Public health institutions not adequately supported for human resource development. There is a need to link the training with current and emerging needs of the health sector , including disease surveillance There is also no plan for continuing education resulting in trained personnel being recruited by the private sector, NGOs, or leaving the country. There is high staff turn-over poor incentives and wages with low levels of motivation	Develop a master plan for public health workforce development and continuing education. Strengthening Public Health institutions to ensure appropriate and adequate human resources to country Enhance motivation of staff through institution of appropriate incentives such as clear career paths

37. At least some staff trained in surveillance or outbreak investigations at the district level was positively answered by 1 of 4. At the health facility level 42% stated there was some training for surveillance but none for outbreak investigations.

38. Laboratory

Strengths and Achievements A fully functional public health surveillance system requires strong and viable laboratories. Laboratory-based surveillance is the best surveillance if quality practices are ensured. There is a general interest in establishing quality laboratory systems. A number of labs visited appeared to have the fundamentals of sound laboratory practice in place. There is availability of some infrastructure and skilled staff, as well as some laboratory systems with basic services available (e.g. some institutions have implemented quality practices). Rudimentary networking and linkages exist, and the concept of hierarchal approach for networking is evident. There is a potential for networking laboratory systems with surveillance and joint field investigation is a common practice. There is realization of the need to link laboratory network with surveillance. There is long experience with FLCF data. The lab participation in AFP surveillance is a good model for integral function of the lab in a public health system. Opportunities include the current polio lab networks and the HIV/AIDS involvement of labs in surveillance. The TB reference laboratory is also fairly good. The up-coming new project for strengthening functions and networking and experience skills to include hospital.	
Problems and Challenges	**Solutions and Actions Needed**
Lack of confirmatory diagnostic capability. Laboratories are weak at district level and non-existent at lower levels. Lack of adequate financial resources. Need for significant resources to build and sustain these. The mobile labs are not well maintained.	Provision of adequate financial, human, logistics and material resources
There is fragmentation with no linkage between lab activity and the epidemiological surveillance system (except for polio). There is limited capacity in terms of functions and networking with virtually non-existent linkage to surveillance. Regular reports not sent to surveillance group.	Ensure participation of laboratories in epidemiological surveillance.
There is no laboratory networking with either laboratory staff or laboratories, and no formal practice to report diseases identified in laboratories. In addition, there are poor linkages with private laboratories. Need to work with pathologist association and NIH to establish a professional organization for laboratories.	Networking across labs at all levels. Involvement of private sector labs. Develop and implement a detailed plan to build lab capacity for priority diseases and laboratory networks
No laboratory based surveillance except polio There is a lack of awareness regarding importance of data and no use of evidence based medicine. There is neither a proper referral or feedback mechanism	Develop national and provincial quality assurance system through local and international technical assistance

There is no quality assurance system and lukewarm attitudes towards documentation of quality practices. There is no ability to document quality of work. Issues of quality not addressed in curriculum. Lack of appropriate bio-safety measures Poor technical capacity on certain issues. No experience with hospital in-patient. Need for a laboratory representative in the EIC and in the preparedness committee. Overburdening of staff and lab system with clinical work. No laws regulating laboratory practices, safety and waste disposal, quality control and assurance, etc., working with professional and other organizations, and no central co-ordination. There is a lack of public health laboratory leadership.	Develop guidelines and train on bio-safety and bio-security. A plan is required to build sustainable lab capacity for human resource recruitment training and development Develop legal and policy framework for laboratories

39. A detailed report and analysis of the public health laboratory system is in Annex 3.

40. **Opportunities for Integration and Coordination**

Strengths and Achievements There is partial coordination within some programs such as the addition of measles and NNT to the AFP surveillance system. DEWS exists as an integral system but is not operationalized at the provincial and district levels. Common software is being used for HMIS. There is the expressed need for integration, and some willingness to share information and resources (such as jointly training of the malaria technicians on TB microscopy in one province). Many surveillance systems overlap. Sporadic examples of attempts to better integrate and coordinate surveillance efforts in some districts which avoids duplication and reduces workload of data providers.	
Problems and Challenges	**Solutions and Actions Needed**
There is predominance of a vertical approach. Few examples of coordination and integration across CDC. Duplication of data collection, overlap of activities and inefficiency. Poor coordination across the various sectors and all levels, and between programs. For example, in many sites, lab confirmation for polio but never measles. Little co-ordination of EPI with HMIS Resistance to integration from programs, coupled with behavioral and attitudinal constraints. Fear of loss of focus and reduction in achievement of program specific objectives	Improve communication among programs under MOH / DOH. Integrate systems if appropriate without compromising on quality. Heads of disease specific programs need to identify areas of integration. Advocacy and communication for enhancing integration, and inter-sectoral collaboration using system approach.

41. Integration within Disease Specific Systems

Strengths and Achievements There is a stated desire to integrate activities between various vertical and disease specific systems. There is an opportunity in the development of the national action plan for this to be instituted quickly.	
Problems and Challenges	**Solutions and Actions Needed**
There is no good model for this occurring in Pakistan. Programs should pool resources for greater efficiency and effectiveness of operations but some programs with external funding sources may have stringent requirements.	Focal surveillance unit at all governmental levels. Specific proposals to integrate activities across programs.

42. Integration Across Sectors

Strengths and Achievements There are a number of diseases that cry for coordination especially zoonotic diseases that require collaboration between veterinary, livestock, agricultural, and health sector. Sporadic examples of success noted e.g. Balochistan CCHF control activities.	
Problems and Challenges	**Solutions and actions needed**
Lack of systematic process for inter-sectoral cooperation. Some sectors may be unwilling to do this or to sustain it.	Development of a strategy and plan for inter-sectoral coordination through a participatory process.

43. Disease Specific Issues

Strengths and Achievements

Although development partner driven, the AFP/polio surveillance system is excellent and works at every level including the community. It incorporates every aspect of surveillance, and even includes molecular sequencing. It is a model surveillance system with linkages across all levels and the laboratory. There is a potential to build a surveillance system in Pakistan based on the success of this model. There are vertical systems in place for monitoring the occurrence of HIV/AIDS, TB, EPI disease, and malaria. These systems are incorporated in the district and provincial health structures and function reasonably well albeit within a very vertical and fragmented structure. There is potential for building on the success of these systems as well.

The HIV/AIDS system is moving towards a second generation surveillance system that will prioritize high risk groups for monitoring. Pakistan remains a low incidence but high risk country. There is a window of opportunity to enhance surveillance for early detection of changing trends and to implement interventional prevention, and control programs, which will save many lives.

Problems and Challenges	Solutions and Actions Needed
It is not entirely clear that the available numbers for vertical programs reflect the reality of the situation.	
Second generation surveillance for HIV/AIDS is at an early stage of implementation. Capacity development is a key challenge for a quality surveillance program.	Strong implementation of phase two surveillance.
Malaria control program has approximately 20 instruments, and EPI over 30, with active case detection for Malaria in the community. There is a need for linking with routine systems.	
Infection control is at an early stage of development with many serious challenges.	Infection control needs to be strongly addressed, including injection safety.

44. Operations Research

Strengths and Achievements

Some operational research carried out in disease specific program such as HIV/AIDS, TB.

Problems and Challenges	Solutions and Actions Needed
Limited capacity and resources.	Develop capacity and training in operational research.

ANNEX 2

PUBLIC HEALTH LABORATORY ASSESSMENT REPORT

Background/Introduction: The Government of Pakistan requested assistance in conducting an assessment of the current status of disease surveillance and in developing a capacity building plan. Any disease surveillance system relies at some point on the availability of accurate and reliable laboratory data. Laboratories capable of producing quality results (results in which there is high confidence of being correct) are particularly critical to the success of effective communicable disease programs. In addition to establishing accurate baseline information about the occurrence of disease, laboratory data are essential for focused surveillance activities and for monitoring the success or failure of communicable disease program activity. To measure the capacity and capability of laboratories in resource limited countries, it is important to have an objective assessment tool and laboratory capability and capacity at various organizational levels.

The tool chosen to assess Pakistani laboratories was the World Health Organization's assessment tool. This software was recently developed by the WHO in Lyon. Seventeen laboratories were included in the two-week assessment (Table 6). The assessment was conducted in the sites listed in Table 6 primarily due to security restrictions and convenience. MOH staff participated in the assessment of each site.

Table 6: Provinces and number of laboratories assessed at various levels

Type of Facility	National	Provincial	District	Rural Health Center	Private Hospital	Total
Islamabad	1	1			1	3
Punjab		1	2	2		5
NWFP		1	1	1		3
Sindh		3	1			4
Balochistan		1			1	2
Total	1	7	4	3	2	17

Pakistan is administratively divided into four provinces (Punjab, Balochistan, Sindh, North West Frontier Province – NWFP), two regions (Federally Administered Northern Areas - FANA and Azad, Jammu, Kashmir-AJK), and the capital territory (Islamabad). There are various levels of health facilities in Pakistan:

- Basic Health Units – small health care facilities where basic services are provided. While malaria smears may be collected here, there are no laboratory services offered at BHUs.
- Rural Health Centers – responsible for BHUs and generally have a small number of beds (10-15) with minimal laboratory services.
- Tehsil Headquarters – larger facilities with more comprehensive patient services. Usually a small laboratory capable of doing basic chemistries, hematology and a few immunological tests (e.g., HepB surface antigen).
- District Hospitals – facilities with a larger number of beds and offering the services offered at Tehsil hospitals, but more comprehensive and may include some microbiological testing (AFB smears and malaria smears).
- Provincial Hospitals – larger facilities than district level hospitals. In addition to services provided at the district level, microbiological culture and susceptibility testing may be performed here.

- Private Hospitals – Like provincial hospitals, a full range of laboratory testing is often offered at larger private hospitals.

Laboratory Assessment Tool: The WHO's electronic assessment tool was the basis for the laboratory assessment. The tool was piloted in a regional health center (Bhara Kahu-Dr. Abdul Wahab Khaleel) in Islamabad. While the tool proved useful as a basis for laboratory assessments in settings where there were laboratories, the pilot demonstrated that a more streamlined tool would be better for regional and Tehsil/Taluk laboratories which have minimal laboratory services.

In addition to the questions in the assessment tool, the following broader open-ended questions were asked:

1. Where is the laboratory located in the organizational structure?
2. What is the procurement/discard process for laboratory reagents/supplies/equipment?
3. What are the links to epidemiologic and surveillance programs?
4. Are there local laws/regulation (likely non-existent, but need to ask) governing operation of a laboratory?
5. What other donors have laboratory components to their programs?

During initial meetings in the pre-assessment workshop, the following additional information was provided about the general nature of laboratories in Pakistan.

Management of laboratories: Most often, a medical doctor (sometimes a pathologist) is responsible for the laboratory. Depending on the number of staff in the laboratory, there may be other supervisors and they will likely be senior medical technologists.

Education of laboratory personnel: Laboratorians are either medical technologists or medical technicians. The former have a four-year degree (BSc) while the latter have a two-year degree. Most laboratories appear to hire individuals with these credentials. Educational programs for medical technologists/technicians are provided at several universities/institutions.

Laboratory Services

1. Laboratory services at the Regional Health Center RHC/BHU levels are minimal.
2. District Level Hospital laboratories, Tehsil Hospital laboratories and Provincial Level Hospital laboratories vary in size. Therefore, laboratory services will vary with the microbiological culture being performed at provincial or private hospitals.

Assessment: Data were analyzed (Table 7) by the type of facilities visited (e.g., central government, government hospital/reference laboratory, intermediate or peripheral facilities, and private laboratories).

Assessment Observations: We categorize observations by strengths and weaknesses of the laboratories assessed. Because this assessment focused on communicable disease, we propose recommendations to establish a framework for a national system of laboratories. The focus and driving need for the establishment of a national laboratory network are laboratory results in which communicable disease surveillance programs can have a high level of confidence. An outcome of this broad approach to strengthening laboratories is that any testing subsequently implemented using this approach would also result in high quality results in which patients, health care providers, and program managers could have confidence.

Strengths

- Facilities are generally sufficient in size and utilities (electricity and water) are most often available although housekeeping could be improved in most facilities.
- Telephone service is available in the majority of facilities.
- Equipment is most often available (although it could be upgraded) and reagents and supplies are generally available.
- Laboratory staff is academically trained and are usually sufficient in number.
- From most staff interviewed, there appears to be an interest in participating in disease surveillance although little reporting takes place currently.
- There are a wide range of laboratory capacities and capabilities.
- There are examples where laboratorians are included in epidemic investigations.
- There is one professional organization (Pakistan Association of Pathologists) that could serve as a focal point for improving the quality of testing in the country.

Weaknesses

- There is no focal point at the national or provincial level for laboratory issues where leadership can be provided to establish and maintain a network.
- There are no national, provincial, or district laws/regulations addressing laboratory practice, safety or waste disposal.
- Laboratory safety and medical waste disposal procedures are lacking.
- There are few laboratories where the concept of a quality systems approach is understood. Without documentation of adequate controls for the analytes/agents being tested and without documentation that the laboratory has tested human samples for the analyte/agent of concern, there is no way of assuring that results are correct.
- There are no organizations, other than the Pakistan Association of Pathologists, where communication and exchange of information can take place.
- There is little training that occurs within individual facilities and there is no centralized organization responsible for laboratory training.
- There is a lack of availability of confirmatory tests/reference testing.

The data collected and attached in Table 7 supports the statements listed above. Overall, physical facilities were adequate, electricity and water services were available, and phones were available. Conversely, housekeeping (general cleanliness) was lacking, electricity could be sporadic and other than in large facilities, backup generators or uninterruptible power supplies (UPS) were not available. The majority of facilities had no Internet access.

A general lack of documentation is a major problem. For example, if an assessor was told that there is standard use of hypchlorite but there is no written procedure for making the appropriate strength solution anywhere in the laboratory, then there is no proof that disinfection takes place. Similarly, most often no written procedure manuals existed.

A major issue that must be addressed if surveillance for infectious diseases is to be established is the capability of laboratories to perform any microbiological procedures. While automated methods for chemistry and hematology have been implemented, microbiological methods that require culture and identification require a much higher level of academic training because much more judgment is involved in providing a final test result. To establish a system that will support surveillance, this issue alone will require a concerted effort on the part of multiple partners in Pakistan.. There are private and governmental laboratories (very few, but sufficient) that could provide country-wide service. Attempts to implement methods for culture and identification at a local level would be costly, require significant human resources and would be exceptionally

difficult to maintain quality. Alternately, a regional system of existing laboratories along with adequate courier services could assure almost country-wide support of surveillance. Such a system could be developed in a public/private consortium.

While there is much work to be done to establish an appropriate laboratory infrastructure to support surveillance, clearly the laboratorians we spoke with were interested in participating and in improving the quality of care they provide. Development of that infrastructure will require resources to assure adequate facilities, trained personnel who are kept updated on laboratory methods, quality assurance of testing, mechanisms that allow timely reporting (e.g., access to the Internet and electronic reporting), and finally, clinicians appropriately trained on the proper use of laboratory resources.

Recommendations:

- Develop a national/provincial network of laboratories that incorporates private sector laboratories.
  - Create a unit/cell in NIH to oversee development of a national network of laboratories that communicates/collaborates with epidemiology (e.g., assures availability of specimen collection kits).
  - Create a position of national quality systems manager in this unit/cell to develop the framework of a program that will assure quality of testing (e.g., access to proper control material, to external quality assurance testing, to equipment maintenance and repair services, and a focal point for laboratory training needs, etc.).
  - Provide training for each of the proposed positions of National Laboratory Network manager and national quality control officer.
    - National network manager with appropriate in-country staffing and with technical assistance develops a plan of action for implementation.

A national network of laboratories requires a central reference laboratory. This laboratory will provide management for the entire national network. In addition, each province would have a reference laboratory and a close working relationship would exist between the provincial laboratories and the central reference laboratory. This could be based on the Centers for Disease Control and Prevention (CDC) in the U.S. The CDC operates as a federal agency with no organizational links to state public health laboratories. Within each province, district laboratories would be linked to the central reference laboratory through their provincial laboratory. The national plan should include a determination of which tests should be performed at which level. For example, microbiological services should not be attempted in settings where quality cannot be maintained because no specimens come to the facility; to maintain proficiency; the laboratory must receive a suitable number of clinical specimens. For example, in the U.S. it was determined that in order to retain proficiency for culture of *Mycobacterium* species, laboratories should receive a minimum of 20 samples a week. The network overall would provide high quality testing, but not all laboratories would perform the same testing. The concept of a managed national network becomes critical because over time technology changes and needs change. Therefore, continual analysis must be done of what services are provided at which level.

- Create a proposed regulatory framework for laboratory practice (to be conducted by National Laboratory coordinator).
  - Review existing laws/regulations from other countries.
  - Develop an appropriate model proposal for Pakistan.
  - Determine potential impact of any proposed law/regulation

There are no laws governing laboratory practice in Pakistan. As the national plan for communicable disease develops, it would be important to consider what federal laws/regulations need to be in place to both assure a level playing field (e.g., ensure that laboratories which do no quality assurance do not benefit from a pricing advantage because of their poor work).

- Develop of a national quality systems program.
  - Establish position of national quality systems manager.
  - Provide training for quality systems manager.
  - Determine potential collaborators (e.g., private sector--Shafil Hospital, Agha Khan University for training, the Pakistan Association of Pathologists, and public sector (AFIP) for external quality assurance programs (proficiency testing)).
  - Reference laboratories participate in international quality control schemes.

The national laboratory would be responsible for developing guidelines and recommendation for laboratory practice and for providing assistance in developing a national quality assurance program. Where such programs already exist (e.g., AFIP) there would be no need for duplication.

- Improve communications to public health programs and among laboratories (including private sector).
  - Develop linkages with communicable disease program(s) to develop a working relationship for strengthening laboratory-based reporting.
  - Work with existing professional organization (PAP) to create a professional 'home' for laboratorians.
  - NIH should establish an annual national meeting of laboratorians to address issues of public health importance.

Laboratory management and staff connections to program activities are non-existent. To perform their work well, laboratorians must know how their efforts contribute to communicable disease surveillance. Professional information exchange should be planned by providing venues such as national meetings on infectious disease, national meetings on laboratory practice, and similar conferences should occur at the provincial level. In addition, it is important to convey a sense of professionalism among laboratorians, which also contributes to quality of work. The Pathologists Association of Pakistan could take the lead responsibility on developing an organizational home for laboratorians. Alternatively a separate organization representing public health (a Pakistan Association of Public Health) could be considered or an association representing public health laboratorians (a Pakistan Association of Public Health Laboratories) could be developed.

- Create the availability of confirmatory/reference testing
  - Determine the needs for confirmatory testing
  - Assure availability of appropriate equipment
  - Provide technical training
  - Create a referral system for confirmation of tests (includes transportation of specimens).

A functional transportation system is critical for specimens of public health importance. Both Shafil Hospital in Islamabad and Agha Khan University in Karachi have and are developing expanded courier systems that transport specimens back to their respective laboratories. A contractual partnership with either or both of these facilities would preclude the government from developing a separate courier system.

Table 7: Quantitative Analysis of Lab Assessment

		Percentage of performance (average or range of percentage of indicators met by the facilities)				
Topic	Indicator	Government Central Level 3 NIH N=1	Government Hospital Reference Level 3 (medical school associated) N= 3[a]	Public health hospital lab (Central and Provincial) Level 2 (government hosp) N=2	Intermediate & peripheral (District, urban, rural) Level 2 or 1 N=9	Private lab/private hospital lab (Shifa, Level 3 N= 2
Building facility and utility services	Overall	92	88-90	76	0-93	96 100
	Physical conditions of facility	50	83-100	100	55	
	Utilities (electricity, water etc.) available in lab (during working hours)	100	70-100	100	88-98	100
	Presence of phone/fax/regular mail	100	100	y/n/y 100	y/n/y 67 y/n/n 33	100
	Presence of E-mail service and computer availability	100	100	0	10	100
Bio-safety, Hygiene and security	Overall	45	19-42	56	28	60
	Written standard protocols (for disinfection, sterilization, waste disposal, lab cleaning, in case of injury)	78	Two 0 One 56	56	32	78
	Training on bio-safety	0	None	100	22	100
	Safety conditions (e.g. use of hypochlorite for disinfection.)	50	50-75	100	19	80
Specimen collection, handling and	Presence of SOPs (for sampling of stool, blood, urine, throat, CSF specimens)	45 (overall) 100	33, 40, 92	57	24	82 100

recording	Sample Requisition Forms	70	50-70	70	56 (take out facilities with no forms and quality of form improves to 71)	100
Equipment, reagents and supplies[b]	Basic equipment (autoclave, incubator, water bath, water distillation system, ELISA reader, Freezer, refrigerator, microscope and candle jar	100	Adequate	NA	NA	98
	Availability of culture media in appropriate laboratories when needed	85	50, 75, 100	100	(5 of 9 do no culturing – of the 4 that perform culture 71% of quality criteria met)	100
	Availability of antisera in appropriate laboratories when needed	29	0, 0, 100 Not available in two – always available in 3rd.	100	100[e]	100
Laboratory tests performed	Microscopy Screening tests (TB, malaria)	100	78-100	100 (TB only)	100	91
	Confirmatory tests (e.g., ability to perform bacteriologic culture	90	100	100 (culture)	20 (TB only)	90
	Serologic tests (Hep C, Hep B, HIV)	100	100	100	67	100
Lab Staff & working time	High level supervisor	100	100	Present in one 50(?)	67	100
	Laboratory working 6 days/wk.	100	100	100	41	100
	Training (national, on site (formal and informal)	0	0-100 Informal only at 2 facilities All 3 categories at 3rd site	100 (1 internet)	27[f]	100

Total Quality and reporting	Overall Standard protocols or guidelines for analysis procedure	67 90	7-48 0-100	21	14	88 100
	Regular supervision by other laboratory	0	0	0	0	0
	Performs Routine QC	56-80	0-100	20	25/0	100
	Perform preventive maintenance to lab equipment	40	0-40	0	13[c]	90
	Reporting of communicable diseases (CD)	100	0-40	0	18[d]	0
	List of reportable diseases in the lab	100	0	0	30 (no documentation)	0
	Reporting of CD	100	0-40	0	13 (no documentation)	0
Involvement in Outbreak	Involvement in outbreak investigation	60	0-40	0	33 (?)	0

A Government Reference Laboratories - Four institutions were assessed, however, one was significantly poorer than the other three so it was considered an outlier and will be dealt with separately in the text. Because of the small number of institutions in this category, ranges are used rather than averages.

B Equipment, Reagents and Supplies – this category was not helpful and much too subjective. Where appropriate, a percentage was entered, otherwise NA (not applicable) was entered.

C Simply responded "yes", but no documentation.

D Lists of reportable disease available, but not reporting.

E Most performed no microbiology, so had no need for antisera. Of those that did perform microbiology, each had antisera needed.

F Only 3 of 9 had any training, 2 of which had only on-site training, and only one had training received at the national level.

? Wherever a question mark appears, there is doubt about the response simply due to lack of documentation.

ANNEX 3

OPTIONS FOR A PUBLIC HEALTH SURVEILLANCE SYSTEM

Annex 3 presents two possible options for structuring a surveillance system in Pakistan. They are not the only alternatives and are presented here as a stimulus for discussion.

OPTION 1

Functional Integration Model / Preliminary Draft
Levels of execution, structure, linkages and functions

1. **District** health office should have a District Epidemiologist under direct supervision of Executive District Officer, Health (EDO-H) – the district health manager. Currently Sindh province is the only province that has a budgeted and dedicated post of District Epidemiologist. Surveillance Team with the District Epidemiologist will include a Case Response team and Data Manager/Assistant.

Structure	Functions	Diseases for Surveillance	Data Transmission
Epidemiologist			**Electronic Mode**
-Investigation and case response team	-Case investigation	-AFP/Polio	-Immediate/Weekly
-BS staff at tertiary level Hospitals	-Case response	-Measles	-Immediate/Weekly
-Computer Expert	-Data Collections	-Tetanus	-Immediate/Weekly
-Public Health labs	-Data Entry	-HIV	-Weekly
-HWs	-Data Transmission	-Malaria	-Monthly
	-Data Analysis on basic indicators and use Review meetings	-TB	-Monthly

2. Epidemiologist will have **linkage** with all the satellite health care facilities (public & private sector), Hospital based surveillance staff in the tertiary level health care facilities (can assist in NCD data collection also), public health laboratories and community through Lady Health Workers of the National Programme for Primary Health Care & Family Planning. *LHWs will be reporting only the prioritized diseases.* Inventory on the public health laboratories both from the public and private will be prepared and a network will be established for the active involvement, quality control and data sharing. District will have arrangements for electronic transmission to relevant levels – provincial public health surveillance cell, relevant provincial program manager, as the need may be.

3. Proposed communicable diseases for surveillance, considering global and national priorities, are acute flaccid paralysis (AFP) for Polio, measles, tetanus, malaria, tuberculosis and HIV/AIDS. Adverse events after immunization (AEFI) and other diseases under Disease Early

Warning System (DEWS) could also be considered. Except malaria and tuberculosis, all diseases' reports will be transmitted weekly. Malaria and tuberculosis will be reported monthly.

4. Epidemiologist will be responsible for surveillance of communicable diseases prioritized by the national and/or provincial levels. District Surveillance Team (DST) will include focal persons by Tehsil (3 to 5 depending number of Tehsils in district) responsible for timeliness of case notification and submission of reports and completeness of reports. DST members could be among the current staff such as District managers for different public health programs, CDC Supervisors, Entomologists – some of the current positions not optimally utilized now. District Surveillance Team will carry out case investigation and case response using the standardized instruments developed at the national level. The team will ensure that guidelines / SOPs developed at the national levels are observed. There will be rumor registry adequately investigated and maintained. Non-communicable disease (NCD) surveillance will be primarily carried out in the tertiary level health care facilities through involving hospital base staff (a focal person designated for this purpose by the hospital manager).

5. Data Manager/Assistant will support Epidemiologist for data and report collection through standardized instruments, data entry and analysis on the program's basic indicators for taking necessary/immediate action, and data transmission to the provincial levels (public health surveillance cell & the relevant program managers). Data Manager/Assistant will be responsible for completeness, accuracy and quality of database and reports generated and forwarded. He will ensure timeliness of data transmission to the provincial levels (feed-forward).

6. Epidemiologist will share his reports from data analysis with the District Surveillance Review Committee which would be chaired by the District Health Manager – EDO (H). The committee will function as a small *working group*. Proposed composition is Hospital Manager, District senior pathologist, physician, pediatrician and District Epidemiologist. The committee will overview the district surveillance system and its performance and identify gaps for finding practicable solutions.

7. Provincial level public health surveillance centre is proposed under supervision of the Director General Health Services in each province and region. There should be a Director running this cell who should be an epidemiologist having management experience. This cell should have regional desks for the districts in the province (may be 8-10 districts managed at one desk) to ensure the close supervision, coordination and timely response. A public health laboratory specialist (microbiologist) will be part of this cell. Provincial level public health laboratories network will be established. These labs will be the referral for the district labs. There will be a data management section in the cell under Data Manager supported by data assistants.

Structure	Functions	Diseases under Surveillance	Data Transmission
Epidemiologist -Regional desks -Computer Expert -Public Health labs	-Data Analysis -Communication and coordination -Supervision -Capacity building -Feedback -Linkage and information sharing with the provincial -Program Managers -Review meetings	-AFP/Polio -Measles -Tetanus -HIV -Malaria -TB	**Electronic Mode** -Weekly -Weekly -Weekly -Weekly -Monthly -Monthly

Director will have **links** with the districts (EDO H & District Epidemiologists) through regional desks and data manager. He/she will liaise with the referral public health laboratory at the provincial level and the different program managers for public health diseases. Data management will help in maintaining close contact with the districts.

Provincial public health surveillance centre will be responsible for monitoring, supervision and evaluation of the district public health surveillance system. Data analysis will be carried out for identifying disease trends, detecting and/or predicting outbreaks and gaps and facilitating the district surveillance teams in the outbreak investigations and other control measures. The centre will ensure timeliness for communication and serve for coordination between different levels and public health programs. Capacity building will be also responsibility of the centre. Regular feedback will be sent to the districts, other programs and the lab. A monthly meeting will be held with the program managers and the laboratory chiefs (microbiologists / virologists / hematologists) for reviewing data and its analysis basing on which progress of different programs would be monitored and program planning would be developed.

Data management section will ensure timely receipt, consolidation and transmission of data, data quality and appropriate analysis. Data manager will send regular feedback to the districts about the data completeness, quality and relevant analyses. Regional desks will be responsible for coordination and supporting the districts in accomplishing the above mentioned functions of the provincial centre.

National Level. All disease surveillance activities will be executed and coordinated through the National Public Health Surveillance Centre (NPHSC). Overall supervisor will be the Executive Director (ED) and there will be provincial & regional desks. ED will be responsible to the MoH/NHIRC. The centre will have support of experts on training, computer (software building & statistics) and social mobilization/advocacy. There will be the representation of national referral laboratories in the NPHSC.

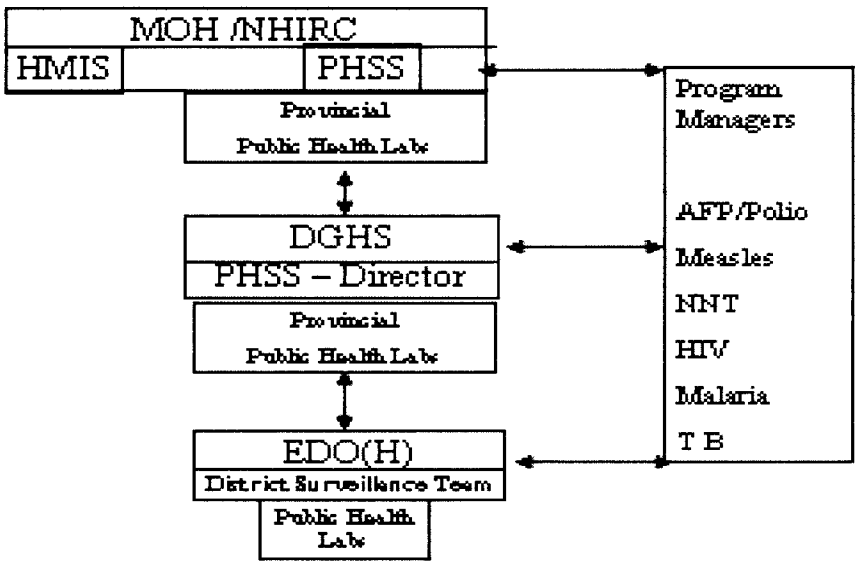
Structure	Functions	Diseases under Surveillance	Data Transmission
PHSS – Exe. Director Provincial Desks Public Health Labs Training and Advocacy Experts Computer Expert	-Data Analysis -Communication and coordination -Supervision -Capacity building -Feedback -SOPs, Guidelines, Manuals, -Instruments -Software development -Linkage and information sharing with the Program Managers -Review meetings -System review periodically	-AFP/Polio -Measles -Tetanus -Malaria -TB -HIV	**Electronic Mode** -Weekly/Monthly

Links will be maintained with the implementation levels (District Surveillance Teams) through the PPHSCs, Programme managers for different diseases control/eradication and referral laboratories. Within the National Health Information Resource Centre (NHIRC) close contact will be built and maintained with National Health Management Information System.

Core functions of the NPHSC will be developing policy, guidelines, SOPs & Instruments, provision of technical support to the provinces, ensuring enabling factors availability, communication and coordination, maintaining linkages, capacity building, periodic program reviews and advocacy and social mobilization. Guidelines for collecting data of prioritized diseases, diagnostic criteria and SOPs for the labs, and quality control measures will be built and periodically updated based on experiential learning of the program and system bugs identified during the monitoring & evaluation. A regular feedback to the provinces and districts and fee-forward to the MOH, development and key partners will be prepared and sent.

Programme monitoring will be carried out through review meetings with the provinces, partners at the national levels and regular data analysis. Training curricula along with program detailing methodologies will be built for each level. Promotional material will be developed and advocacy activities will be carried out to support surveillance.

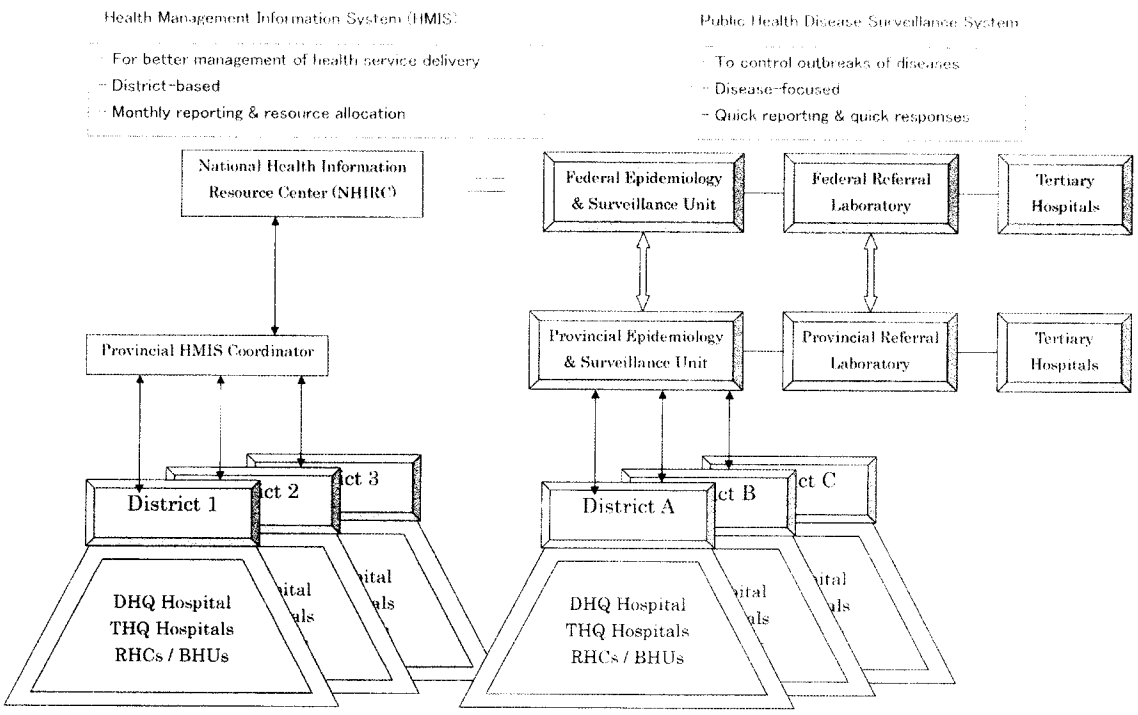
Public Health Surveillance System *(Proposed)*



Risk Factors Analysis:

- Raising the Political commitment for the need of surveillance system in the country.
- Adequate funding provision for all levels surveillance activities to address the sustainability.
- Consensus on the 5-6 priority diseases for the initial beginning.
- Building confidence of the program managers at the national and provincial levels, facilitating the timely provision and use of surveillance information by the program managers.
- Concept Disease Surveillance system viz a viz Information Systems (HMIS) need further clarification at all levels.
- Enabling factors for the functioning of surveillance teams at all the levels.
- Community confidence in the system that this is beneficial for them, preventing and timely management of outbreaks in the populations.

OPTION 2

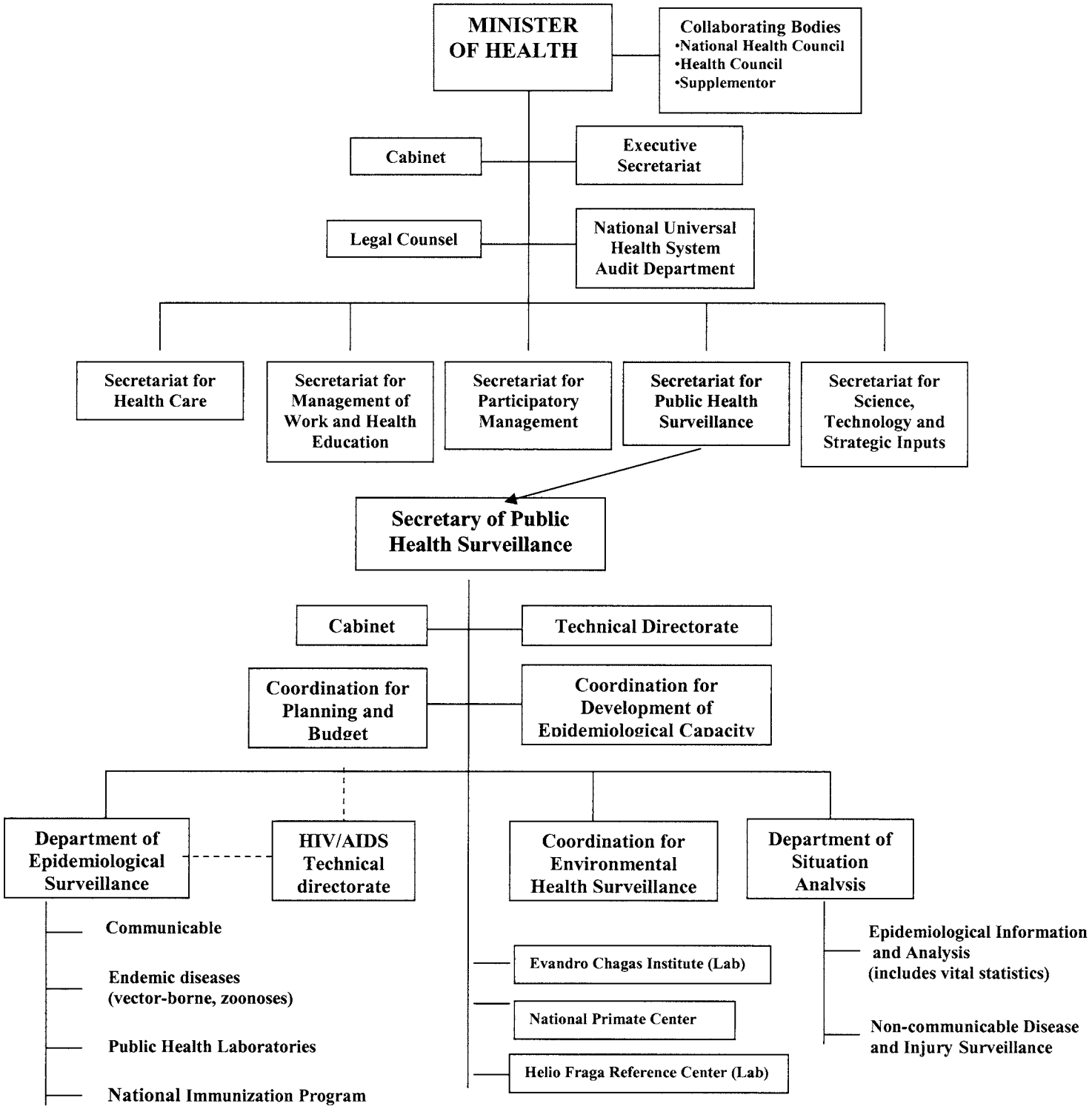


Option 2 was proposed by Dr. Yomo at JICA and includes a schematic representation of the flow of information from the district to the federal level. Coordination between HMIS and the surveillance unit would need to be defined. Information for both systems is coming from the same places: community and facility, and the information data base could start with common data entry but cases previously identified as requiring surveillance action also be sent up the surveillance channel which would have a 'faster track' for response.

ANNEX 4

SURVEILLANCE STRUCTURES FROM OTHER COUNTRIES

THE BRAZILIAN MODEL



Diseases Notification in Chile