Centers for Disease Control
and Prevention (CDC)
Atlanta GA 30333

November 9, 2007

Dr. Anbumani Ramadoss
Union Minister
Ministry of Health and Family Welfare
Maulana Azad Road
Nirman Bhawan
New Delhi 110 011 India

Dear Honorable Minister Ramadoss:

I am pleased to send you the technical report of the IDSP review conducted by the 5-member CDC team in September. I would like to first convey to you and your senior staff appreciation of the CDC members who met with various Ministry staff and partners over the one-week stay in India. I also thank you for your taking time to meet with them in Chennai.

I have gone through the report and the recommendations of the CDC delegation. In my internal briefing by the delegation, the need to continue interaction with NICD and MOH was mentioned. I agree with this recommendation and would like to suggest you consider having CDC become an integral part of the World Bank assessment and support process over the next few years. In this manner CDC can continue to contribute by providing technical evaluation and support for the epidemiologic, IT, laboratory, and the management aspects of the IDSP program.

If you agree with this suggestion, I would like to suggest CDC, WB and NICD/MOH develop a Technical Support Plan (TSP) for the next 12 months. The WB can facilitate the TSP between NICD/MOH and CDC by monthly video conferences and/or in-person meetings on topic of interest. In my view, this strategy will allow real-time evaluation of plans and activities and allow us to detect problems and issues that can be corrected in a timely manner.

I hope you will find the technical report and my proposal for more interactions between WB, CDC, and NICD-MOH valuable. Please let me know if you have any questions or need additional information.

Sincerely yours,

Stephen B. Blount, MD, MPH
Director, Coordinating Office for Global Health
Centers for Disease Control and Prevention

CC:

Mr. Naresh Dayal, Secretary Department of Health and Family Welfare
Dr. Shiv Lal, Director National Institute of Communicable Diseases
Dr. Nirmal Ganguly, Director General Indian Council of Medical Research
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Dr. GNV Ramana, Public Health Specialist, World Bank
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CDC Review of the Integrated Disease Surveillance Project--India, 6-17 September 2007

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Acknowledgement
The CDC mission is grateful to the Honorable Minister of Health and Family Welfare for inviting us, to the Secretary Department of Health and Family Welfare, to the National Institute for Communicable Disease (NICD) for organizing and supporting the mission, and to the Indian Council on Medical Research (ICMR) and others at the national level for providing their insights; and, of course, to multiple people at the state and local level for their hospitality, kind assistance, and willingness to openly share their experiences. Grateful acknowledgement is also made to the U.S. Department of Health and Humasn Service (HHS) office- New Delhi,US Embassy for their support.

Executive Summary

At the request of the Ministry of Health and Family Welfare, a five person CDC team conducted a macro level review of the Integrated Disease Surveillance Project (IDSP) from 6-17 September 2007. The team met with relevant staff from multiple agencies in New Delhi and conducted field visits to health facilities at all levels in two states, Rajasthan and Tamil Nadu.

Key observations

- Responsibility for communicable disease surveillance at the national level is currently carried out by several separate organizations. Overlapping responsibilities, differing capacities, lack of coordination, and lack of clearly defined roles have hampered development of an effective surveillance system.
- The initial project design for IDSP was ambitious for the proposed time frame. IDSP has now appropriately focused its objective on establishing a decentralized system of disease surveillance to detect and respond to outbreaks. Achievement of this objective requires state ownership which is highly variable at this time and accounts, to a large extent, for the overall mixed picture in the current status of IDSP implementation.
- The project has achieved several key accomplishments, but has not yet been able to demonstrate a significant impact on outbreak detection due to a combination of design limitations and slow implementation. Key factors include: inadequate human capacity at the national and state/district level, simultaneous overabundance of fragmented datasets and major gaps in reporting, and limited public health laboratory capacity.

Key recommendations

1. Overall national responsibilities for communicable disease surveillance need to be harmonized. To become recognized as a credible leader in public health surveillance and to enhance its response capacity, NICD/CSU would benefit by having additional human resources as well as management and administrative independence, flexibility and authority. Well functioning surveillance systems for vertical disease control programs should remain as currently operating; however, efforts should be explored to use their infrastructure to assist local IDSP activities.
2. Developing an early warning—epidemic alert and response system should remain the primary objective of IDSP, but further efforts are needed to engage state and district governments. Additional dedicated epidemiologists at this level are essential. State officials need further sensitization to the importance of surveillance.
3. Key tactical priorities for the next two years are to enhance case and outbreak detection, improve the quality of outbreak investigation and response, and strengthen analytic capacity. Expand capability for health provider notification through a dedicated call center; reduce syndromic reporting and increase data from urban areas and the private sector; expand public health laboratory capacity in a focused, stage approach with emphasis on quality assurance; and establish an IDSP Informatics Workgroup. Ideal key performance indicators would include the number of outbreaks detected and the quality of investigation.

Background

India faces multiple challenges in attempting to develop and effectively implement a national disease surveillance system. The tremendous disease burden, sheer size of the country and population, and wide inter and intra-state variability in health infrastructure all contribute to difficulties in monitoring disease burden and detecting and responding to outbreaks. Nevertheless, the extensive human resource capacity and well documented recent advances in critical areas such as information technologies and health research present India with a wide open opportunity to develop a comprehensive surveillance system appropriate to meet the nation's public health needs.

Initial efforts to reach this goal began with the National Surveillance Program for Communicable Diseases (NSPCD) which was piloted in 93 districts beginning in 1998. Based on lessons from this effort, in 2004 the Government of India (GoI), in collaboration with the World Bank, launched the Integrated Disease Surveillance Project (IDSP) with a budget of INR 408 crores (US$102 million) and broadly ambitious goals for establishing national surveillance for both communicable and non-communicable diseases and events in a phased approach throughout the country. Responsibility for implementing the IDSP was initially housed separately within the Ministry of Health and Family Welfare (MoHFW) and then moved to the Central Surveillance Unit (CSU) of the National Institute for Communicable Diseases (NICD) in 2005.

While some substantive objectives, particularly in developing a capability for information technology, have been accomplished to at least some degree, external review missions over the last three years have faulted IDSP for slow implementation. Additionally, the failure to detect several large, high profile disease outbreaks prior to media announcement has drawn critical attention to IDSP's capacity from within the GoI itself.

CDC Mission

At the request of the MoHFW, a five person CDC team conducted a macro level review of IDSP, including specific observations on laboratory and informatics capacity, from 6-17 September 2007. The team met relevant staff from multiple agencies in New Delhi and conducted field visits to health facilities at all levels in two states, Rajasthan and Tamil Nadu. [1]

The primary objective was to determine how IDSP is progressing and to determine whether any changes are required in the current model of the project. The focus was on IDSP as a national project incorporating multiple levels of government and was not limited to an evaluation of the performance of the CSU within NICD. While a thorough assessment of a project of this magnitude needs to be based on an understanding of the cultural context of surveillance and, most importantly, on the overall structure within which it attempts to operate, this report does not attempt to provide a comprehensive evaluation of the entire communicable disease surveillance system in India. We do seek to provide general observations on the overall structure as it impacts reaching the goals of IDSP.

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[1] See Annex A for detailed terms of reference, methods, itinerary, and principle persons met.

Review of the Integrated Disease Surveillance Project (IDSP)

Key observations

- While key national level leaders have recognized the importance of surveillance for public health, economic and broader policy rationale, **surveillance is often seen as a low priority within the union, state, and local governments as well as among health providers in general**. Outbreaks are characterized as a failure of the system rather than a naturally occurring phenomenon to be expected and the detection of which is actually welcomed as a sign of a well functioning surveillance capacity.

- Responsibility for communicable disease surveillance at the national level is currently carried out by several separate organizations, including NICD, the Indian Council on Medical Research (ICMR), and the Central Bureau of Health Intelligence (CHBI). The picture is further complicated by the differing lines of authority for medical education (and thus local medical colleges) and other areas of health and family welfare within the MoHFW. Multiple disease control programs (e.g. polio, TB, HIV, vector born diseases) also operate vertical surveillance systems, which for the most part, provide complete, timely, and reliable data for their specific targeted disease. **Overlapping responsibilities, differing capacities, lack of coordination, and lack of clearly defined roles, especially between research and field epidemiology, has hampered development of an effective surveillance system-- particularly for outbreak detection and response.**

- In comparison to the historical development of national surveillance systems in other large countries with similar federal governmental structures such as Brazil and the United States, the initial objectives of IDSP were extremely broad. **Initial project designs, particularly in terms of the breadth of categories to be included and expectations for integrating multiple disease control program operations at the local level, were ambitious for the proposed time frame.**

- IDSP has now appropriately focused its objective on establishing a decentralized system of disease surveillance to detect and respond to outbreaks. While union level efforts to provide training and technical assistance, to develop surveillance tools, and to conduct national level analysis are critical, the overall success of the project depends on state and local governments accepting primary responsibility for the system and developing their own epidemiologic capacity. **Achievement of this latter goal of state ownership is highly variable at this time and accounts, to a large extent, for the overall mixed picture in the current status of IDSP implementation.**

- **Notably since the transfer of responsibility for IDSP to NICD, the project has achieved several key accomplishments**, including: development of informatics capacity at the district level, increasing number of districts with regular reporting, strengthening laboratory capacity in selected areas, establishing surveillance

guidelines, completion of master trainer courses, and development of training curriculum and a distance learning network. Funding has been adequate.

- Outbreaks are being detected and responded to at the local and district level; however, the sensitivity of detection and quality of response is unclear. What does appear clear is that these efforts are not being consistently reported or coordinated through the IDSP system. **The project has not yet been able to demonstrate a significant impact on outbreak detection due to a combination of design limitations and slow implementation**. Key issues include:

    - Inadequate human capacity at the national level and dedicated surveillance staff at the state/district level, which is secondary both to systemic bureaucratic issues and to a general lack of adequately trained epidemiologists.
    - Simultaneous overabundance of fragmented datasets and major gaps in reporting. Development of informatics capacity to accumulate and aggregate data has far outstripped the development of analytic capacity. This imbalance often complicates meaningful analysis, especially for disease trends. Major gaps remain in gathering data from urban areas, the private sector, and even some public sector facilities.
    - Capacity to rapidly and reliably detect a wide range of organisms exists primarily within the research laboratory network. The capacity of public health laboratories for microbiology remains limited in spite of some recent efforts through IDSP to expand state and district services. Critical missing elements are the capacity to provide required training, availability of materials with which to perform testing subsequent to training, and lack of a process for assuring continued quality assurance and engagement of laboratories within the system. Data management systems for storing and sharing laboratory information are largely absent.

Key recommendations

- **Meeting the public health goals for communicable disease surveillance will require inputs from multiple agencies; however, overall national responsibilities need to be harmonized.** The framework developed by the global Health Metrics Network may provide a suitable model for this harmonization. Roles for surveillance should be clearly defined and consideration could be given to creating a mechanism to coordinate activities, including for outbreak detection and response. ICMR has become recognized as a leader in health research due to its capacity for scientific excellence as well as its administrative flexibility in hiring, travel, etc. To become recognized as a credible leader in public health surveillance and to enhance its response capacity, NICD should have administrative and management independence, connectivity, and authority similar to ICMR.

- **Developing an early warning—epidemic alert and response system should remain the primary objective of IDSP.** Integrating disease surveillance across vertical disease control programs for tracking disease burden is a longer term objective that can be approached in strategic phases. Delegating non-

communicable disease surveillance to ICMR and focusing on epidemic prone communicable diseases is an appropriate focus for IDSP at this time. Additional national surveillance goals should be outlined in a comprehensive 10-15 year long term strategic plan to ensure that the project is sustained.

- **Further efforts are needed to engage state and district governments in surveillance,** including additional designated staff (e.g. full time state and district epidemiologists), sensitizing state Principle Secretaries, and offering competitive grants for innovations to meet IDSP objectives. In general, well functioning surveillance for vertical disease control programs should remain as currently operating; however, efforts should be explored to use their infrastructure to assist local IDSP activities. The proposed pilot project utilizing the National Polio Surveillance Project (NPSP) staff in ten districts should be implemented and evaluated as soon as possible.

- **Key tactical priorities for the next 2 years are to enhance case detection, analytic capacity, and outbreak response.** Sharply reduce the quantity of data collection for nonspecific syndromic data, and redirect the focus of surveillance to higher quality detection and investigation of more salient public health signals. Outbreak detection could be enhanced by developing capability for health provider notification and strategically targeting selected sites for additional information collection, including active surveillance. Additional trained epidemiologists at the state/district level could be augmented by further use of analytic software focusing on probable cases rather than syndromic data. Clear guidelines should be presented for early outbreak reporting and outbreak responses should be regularly evaluated.

- **Expanding laboratory capacity, including quality assurance, at the state/district level will be essential to increase the sensitivity and specificity of the overall surveillance system.** The upgrading of state and district laboratories should proceed in a focused, staged approach. Rather than developing laboratories in every district at this time, efforts should focus on developing capacity for diagnosing epidemic prone diseases in a few laboratories designated to provide support for multiple areas, coupled with efficient plans for quality transport of specimens. Plans should be developed to ensure that even non-focus states are provided with access to at least some minimum laboratory capacity.

- **In order to clearly articulate the epidemiologic needs for the emerging informatics structure, establish a formal IDSP Informatics Workgroup which would include embedded staff from the National Informatics Center (NIC).** A priority task of the workgroup should be to design analytic software applicable to end-users at the district, state, and national levels.

Expanded observations and recommendations

Is IDSP doing the right thing?

According to the Project Implementation Plan (PIP) in November 2004, the original objectives of IDSP were to establish a decentralized state based system for surveillance of communicable and non-communicable diseases and to improve efficiency of surveillance activities of disease control programs. The PIP included a broad directive for weekly/sentinel surveillance for communicable disease, tracking of non-communicable disease, and sentinel surveillance for road accidents and water and air quality. Specific disease control programs were to be integrated at the local level.

However, as implementation of IDSP began, project directors have recognized the need to focus activities. In response to previous evaluations and policy imperatives, the IDSP has begun to prioritize outbreak detection. Responsibility for non-communicable disease risk factor determination was shifted to ICMR and tracking of water/air quality and road accidents was deferred. Geographic priorities have also shifted. While the initial plan envisioned encompassing 9-14 states in each of three phases, IDSP now focuses on achieving implementation in 14 key focus states.

Observations

The original objectives of IDSP were extremely broad, especially for the projected five year term of the project. Countries with generally similar federal systems of governance, such as Brazil and the United States, have relied on state and local capacity as the IDSP intends to do; however, their systems have been built up over 15-20 years and still have acknowledged gaps in surveillance. Although adding non-communicable diseases and other health indicators is a worthwhile long term goal, surveillance for these areas threatened to be a distraction from the key objectives of outbreak detection and ascertaining disease burden in a decentralized surveillance system.

Recommendations on fundamental components of IDSP

1. **For the remainder of the initial project implementation period through 2009 IDSP should focus on two key areas: a) outbreak detection and control, and, to a lesser extent, b) determination of disease burden.** While these two objectives require somewhat different approaches, they are complementary and both should be continued.
   - Developing an early warning-- epidemic alert and response system should remain the primary objective of IDSP. The decentralized approach focusing on the state/district is sound; CSU/IDSP should provide national technical leadership, quality control, training, and technical assistance.

   - Integrating disease surveillance for tracking disease burden (including across vertical disease control programs) is a longer term objective that can be approached in strategic phases. Focus of this component for the next 1-2 years for CSU/IDSP could be to coordinate disease information from disease control programs at the national level and produce a quarterly or monthly national communicable disease surveillance bulletin. This bulletin could include

epidemiologic analysis of recent outbreaks and complement the annual statistics provided by CBHI.

What is the convergence of CSU/IDSP's role within the broad arena of communicable disease surveillance?

In keeping with the general principle that health is a state responsibility, the decentralized approach of IDSP relies heavily upon state and district involvement in surveillance. State and district surveillance committees and units have the primary responsibility for implementation and supervision of all surveillance activities, including epidemic detection and response. At the union level, the CSU of IDSP draws heavily upon resources from other divisions within NICD, including Epidemiology, Microbiology, and Zoonosis.

In addition to IDSP, there are multiple other programs involved to varying extent in both prime objectives of communicable disease surveillance (e.g. detecting outbreaks and monitoring disease burden). Although ICMR's primary mandate is health research, its extensive and high quality laboratory capacity has been utilized for general surveillance and outbreak diagnosis due to gaps in the public health network. Disease control programs, such as those for polio, TB, HIV, and vector borne diseases, have developed their own primarily vertical surveillance systems tailored to meeting specific programmatic needs. The CBHI also collects a wide spectrum of epidemiologic, demographic, financial, and programmatic data for a comprehensive annual report.

Special note should be made of the decision to re-program a portion of the original budget allocation for IDSP to focus on surveillance for avian influenza. Using IDSP funds, the NICD plans to establish a national sentinel surveillance system to monitor influenza at 18 laboratories (in addition to nine already established by ICMR).

Observations

There is wide variability among the states as to the priority given to surveillance and their capacity to implement disease/epidemic detection and response. Tamil Nadu has even gone to the extent of implementing daily surveillance for some syndromes; but other states have only rudimentary and sporadic reporting.

While multiple agencies are making substantial contributions to disease tracking and outbreak detection/response, implementation of IDSP and development of a comprehensive integrated national system for communicable disease surveillance has been hampered by overlapping responsibilities, differing capacities, lack of coordination, and lack of clearly defined roles, especially between research and field epidemiology. This phenomenon is noted at the local level with the duplication of routine reporting requirements, but is perhaps most pronounced during outbreaks.

Recommendations on convergence

2. While providing key public health leadership and epidemiologic technical assistance is a primary role of the CSU/IDSP, progress in implementing IDSP depends on ownership at the state/local level and strategic collaboration among disease control programs and other MoHFW agencies.

- State ownership can be enhanced by adding additional designated staff (e.g. full time state and district epidemiologists), sensitizing state Principle Secretaries, and offering competitive grants to states for innovations to meet IDSP objectives. Once state epidemiologists are in place, development of a national body (such as the US Council of State and Territorial Epidemiologists) may further intra-governmental collaboration.
- Roles for the different government agencies involved in surveillance should be clearly defined and consideration could be given to creating a mechanism to coordinate activities, including for outbreak detection and response. The Health Metrics Network (HMN), a global partnership headquartered at WHO may provide a useful model for a coordinating framework.
- While convergence for data collection at the local level could be improved over the next 2 years starting with vector born disease control, well functioning surveillance for vertical disease control programs should remain as currently operating. Efforts should be explored to use the infrastructure of disease control programs to assist local IDSP activities through establishing regular coordination mechanisms between IDSP and these programs. The proposed pilot project utilizing the NPSP staff in ten districts should be implemented and evaluated as soon as possible.
- The upcoming CDC mission in late October 2007 to review influenza surveillance in India should include a focus on the potential overlapping responsibilities between NICD and ICMR in this critical area.

Is IDSP on the right pace to meet its objectives?

Previous evaluations from the World Bank have critically noted the slow pace of development in terms of the project's time frame (2004-09). These evaluations have primarily measured IDSP by process indicators, e.g. number and percentage of districts reporting. Acknowledgement has been made of the progress over the last year in increasing these indicators, providing computers and data/administrative personnel at the district level, and training staff .

Shifts in the geographic priorities have also altered the prospects for phasing in all states (especially the 12 states in Phase III) by 2009. Developing laboratory capacity has also been targeted to 50 priority districts within the 14 focus states. (See more below on laboratory capacity.)

Observations

Given the enormity of the task, targeting the focus of activities to demonstrate progress in selected key states appears to be an appropriate strategy for IDSP. Testing various tools and approaches in different states can provide models that other states can use in the future and can help build momentum for expansion. Nevertheless, the risk is that certain states with poor infrastructure will perpetually be left behind unless there is a

comprehensive plan to ensure some minimum capacity is generated throughout the country.

While the process indicators can provide useful benchmarks, additional evaluation tools can be introduced to focus attention on the output expected from IDSP and shift the emphasis from case counting to analysis and response. Qualitative reviews can be utilized to gauge the progress of IDSP as well as provide substantive inputs to improve the system.

Recommendations on pace of IDSP development

3. MoHFW should consider developing a long term strategic plan for national surveillance w/ 2, 5, and 10 year goals to make IDSP project objectives sustainable as a program.

- System capacity needs to be developed in stages. However, while IDSP should continue to focus implementation on the 14 priority states for the next two years, the longer term plan should address how to ensure some minimum capacity in the Phase III states. Even without comprehensive state PIPs the CSU, if provided additional human resources, could work with these states to develop outbreak detection on a targeted scale and response capability supported by union level or other states.

4. Consider evaluation of IDSP by additional indicators, e.g. focusing on outbreaks reported and adding quality of outbreak investigations.

- Tools to evaluate the quality of outbreak investigations have already been drawn up by NICD and the Field Epidemiology Training Program (FETP). The FETP also has experience in conducting such evaluations and could assist in both conducting such investigations and training others to do so.

Is IDSP using the right tactics to meet its objectives? (See also Annex B)

NOTE: Both Drs Ostroff and Broome have recently reviewed the tactical status of IDSP and offered a series of clear recommendations.[2] While some of these recommendations are currently being addressed, for the most part, the CDC mission essentially found much of the same issues and generally concurs with their findings. Since the CDC mission's task was to provide a more macro view, this report will not attempt to repeat a detailed tactical assessment except to highlight certain key points relevant to other recommendations.

The key questions are: What are the core conditions that need to be tracked? Where will they be diagnosed? How can outbreaks best be documented by the surveillance system early enough to be able to generate an effective response? How can the quality of outbreak response be improved?

Observations

[2] The CDC mission gratefully acknowledges the input of previous reviews of IDSP, particularly those by Dr. Steve Ostoff in November 2006 and Dr. Claire Broome in June 2007.

- There does not appear to be a clear consensus on what core conditions should be tracked through the IDSP.
- IDSP has not yet been able to demonstrate a significant impact on outbreak detection due to a combination of design limitations and slow implementation.
- There are two main sources of information for detecting outbreaks: 1) recognition of unusual clinical presentations (e.g., Acute Flaccid Paralysis, etc.) or clusters of disease by astute clinicians, laboratorians, or community members; or 2) detection of unusually large numbers of routinely reported cases or syndromes through statistical accumulation and analysis. IDSP has focused almost entirely on the latter, with little to no yield in terms of outbreaks detected or public health responses. Expenditure of effort to accumulate and aggregate routine data has far outstripped the development of capacity to analyze the data Nonetheless, despite the massive data collection effort, clear gaps remain in gathering data from urban areas, the private sector, and even some public sector facilities.
- Outbreaks are being regularly detected and responded to by local health providers but not necessarily reported upstream unless the outbreak cannot be controlled. Outbreak recognition at the national level often occurs near or after the peak.
- Rapid response teams have been identified at all levels, however, the breadth and quality of investigations remains unclear.

Recommendations on tactical approaches

5. **Implement recommendations from Drs. Ostroff and Broome to expand analytic capacity, strengthen strategic information collection, and evaluate outbreaks.** Specifically, key recommendations include:

- Clearly prioritize identification of a limited number of "events of public health concern" w/ epidemic potential.
- Improve capacity for reporting of outbreaks by health care providers, especially from the private sector. The proposed call center should have a separate channel to field provider input. A critical component of this initiative is to rapidly communicate these provider inputs to local public health officials for an appropriate and timely response.
- Strongly consider discontinuing the reporting of highly prevalent and nonspecific syndromes (e.g., fever, diarrhea episodes, and upper respiratory tract infections) represented on the S Form. Instead, encourage continued active surveillance and reporting of suspicious outbreaks by local health staff, and reinforce the detection and laboratory confirmation of important infectious diseases.
- In order to strengthen strategic information collection, target key infectious disease hospitals starting with active surveillance of inpatient data.
- Provide clear guidance from the CSU to state and district surveillance units regarding expectations of outbreak reporting. The CSU should systematically evaluate selected outbreaks for incorporation into a periodic communicable disease bulletin.

What human capacity is needed to meet IDSP objectives?

The CSU/IDSP has only four staff (two of whom are on detail from other assignments). Staff from other divisions within NICD, including Epidemiology, Microbiology, and Zoonosis provide additional support when available but have other full time responsibilities. IDSP has succeeded in providing 2-3 staff in most priority districts to

assist with administration, finance, and data management. However, the key person at both the state and district level (e.g. the State Surveillance Officer and the District Surveillance Officer) have been assigned their IDSP role in addition to their other ongoing responsibilities. *(Additional note is made below regarding needs for laboratory staff capacity development.)*

A three-tiered training plan has been implemented to provide master trainers (state and district level), medical officers, and health workers an orientation to IDSP. Training for the first tier of master trainers has been completed for Phase I and II states. This includes a 2 week course on field epidemiology designed by the FETP for district staff. Plans are in place for further cascade training and use of the satellite network (EDUSAT) to develop more local capacity.

WHO/India has provided ongoing technical assistance for IDSP. Inputs in the areas of epidemiology and microbiology have been important adjuncts to CSU capacity. Plans are in place for a pilot project in ten districts for surveillance medical officers from WHO's National Polio Surveillance Project (NPSP) to assist the efforts of the local District Surveillance Officer.

Observations

There is inadequate human capacity at all levels to meet expected outcomes. IDSP is unlikely to meet its objectives unless there are more trained staff dedicated to surveillance. Other national surveillance programs with a similar reliance on state/local systems (e.g. US and Brazil) have multiple more staff at the federal level. At the state/district level, overburdened staff are not able to give the necessary attention to the IDSP due to a myriad of other competing responsibilities.

Extensive efforts are being made through IDSP, FETP, and others to develop national capacity for epidemiology. The use of short courses, selected training institutes, and distance learning seem appropriate strategies to address the multiple training challenges inherent in a program of this magnitude.

Recommendations on human capacity for IDSP

6. **While recognizing systemic administrative and financial constraints, efforts should be made to maximize epidemiologic capacity at all levels—national, state, and district.**
   - CSU/IDSP would highly benefit from additional epidemiologists and further integration with the epidemiology and microbiology divisions at NICD. Given the importance of media in outbreaks, consideration should be given to adding communication staff within the CSU.
   - Full time trained, experienced epidemiologists are essential at the state and district level. In the short term consider contracting qualified epidemiologic advisors such as recent FETP graduates and utilize the capacity of disease control programs at the local level.

What laboratory capacity is needed to meet IDSP objectives? (See also Annex C)

Implementing IDSP, especially for outbreak identification, requires an extensive network of reliable, qualified laboratories. The initial design for IDSP envisions a three tiered approach of laboratory support at the public health center, district, and state levels with increasing capacity at each level. This system is to be supported by national reference laboratories selected throughout the country.

Diagnostic capacity for large scale outbreaks is now provided through multiple sources, primarily laboratories from medical colleges, NICD, and ICMR. The CSU/IDSP has conducted a review of state and district public health laboratories which documented gaps in staff, equipment, and reagents. Due to these gaps, most local outbreaks fail to include proper laboratory investigation.

Observations

Public health laboratory capacity for confirming infectious disease outbreaks is minimal and primarily limited to serologic assays. There is virtually no capacity for performing culture for infectious disease agents except at specialized laboratories. Critical missing elements are the capacity to provide required training, availability of materials with which to perform testing subsequent to training, and lack of a process for assuring continued engagement of laboratories within the system. Data management systems for storing and sharing laboratory information are largely absent.

Initial IDSP efforts have targeted procurement of equipment/supplies at the state level and for 50 targeted districts within the 14 focus states. Equipment/supplies are mostly in place even in areas where staff are not yet available. MD/Microbiologists have been the standard for supervisory positions as laboratory directors but are in short supply in India. Appropriately, some states are now giving consideration of hiring MSc Microbiologists as supervisors/directors. Phased training for local laboratory staff has begun in some states. However, even if staff and equipment are available, there is some concern as to whether all the targeted laboratories will be able to process the volume of samples necessary to maintain proficiency for all designated testing.

Except for national laboratories and some other laboratories involved in disease control programs, systematic quality assurance measures are still under discussion and development. The laboratories of ICMR have a critical role to play in research and providing support in identifying outbreaks, especially for diagnosing uncommon diseases. Laboratories in the NICD network are primarily geared to providing support to field epidemiologic surveillance.

Recommendations on laboratory capacity

7. **Maintaining quality assurance and developing a reliable public health laboratory capacity linking laboratory and epidemiologic data is essential for full implementation of IDSP.** This could be addressed by:
   - Supporting the implementation of the proposed Clinical Establishment Act which requires a registration and subsequent certification process for accreditation of all laboratories within two years. This implementation would give a priority to

instituting and maintaining a laboratory quality assurance approach essential for a reliable diagnostic capacity.

- Upgrading state and district laboratories in a focused, staged approach. Emphasis should be to develop capacity for diagnosis of key epidemic-prone diseases. Initial steps should be to develop a fewer number of selected laboratories with adequate quality assurance which can provide diagnostic support for surrounding states or districts. Improvement in overall IDSP capacity should be focused on providing these selected laboratories with appropriate equipment, trained staff, and data management systems.
- Identifying the role of ICMR and medical colleges' laboratories for training, quality assurance, and reference services.

What informatics capacity is needed to meet IDSP objectives? (See also Annex D)

Informatics (including capacity for data transfer and communication for training) has expanded rapidly in the initial phases of IDSP development,. Data collected through a multitude of registers and forms at the sub center and public health center level are transmitted weekly to the district level, usually by courier Data can now be reliably transmitted electronically from the district to state and national levels using standardized formats.

Regular analysis of data at the district or state level appears to be limited. An "interim" analytic tool is currently available in a few locations, but has not yet been fully evaluated. The National Informatics Center (NIC) has been given responsibility for developing and deploying a more comprehensive analytic software application.

Communication links are also being established through the EDUSAT network to provide distance learning capacity from the national level to over 800 sites nationally. The NIC has been given turnkey responsibility for fully developing this system. Approximately half the sites are thought to be currently functional.

Observations

NIC appears to have an impressive capacity for software design. However, the Center lacks expertise in epidemiology and there is a clear need for better coordination of informatics activities between the CSU and NIC. The current software application for data analysis needs to be redesigned for the primary end-users (CSU and field staff). Unless well coordinated with NIC, frequent changes to the fundamental data collection instruments of IDSP may obstruct the implementation of an operational information system.

NIC also appears to have the capacity to develop and deploy satellite and broadband connectivity to rural communities. This system could be an appropriate method to provide continuing education for widely dispersed staff; however, the mission was not able to observe the system in operation.

Recommendations on informatics capacity

8. **Informatics capacity could be improved and strengthened by establishing closer links between the CSU and NIC.** This could be addressed by:

- Developing a formal IDSP Informatics Workgroup which would include relevant participants from the NIC, CSU and possibly other technical agencies (e.g. WHO). A key goal of the workgroup should be to fully develop and evaluate an analytic software tool for data analysis. This tool could prove useful for detecting outbreaks and monitoring disease trends but should be viewed as a supplement and not a substation for basic training in epidemiology for local staff.
- Embedding a staff member from NIC in the CSU to enhance daily communication.

Conclusion

The IDSP has the potential to provide much needed surveillance capacity for India. After starting with very ambitious goals, the IDSP is now appropriately focused on providing outbreak detection and response. However, to fully meet this objective, further efforts are needed to coordinate surveillance at the national level, increase state/district capacity and participation, provide quality laboratory backup, and facilitate inputs from health care providers. National leadership has been critical in setting the vision for establishing IDSP and will be necessary to guide the evolution of this project into a sustainable program capable of substantially contributing to the public health needs of India.

Annex A. CDC Mission Objectives and Methods

CDC Mission Objectives:

1. Conduct macro level review of IDSP to determine how the project is progressing and to determine whether any changes are required in the current model of IDSP.
2. Conduct review of IT systems and software components that are being built by IDSP for data collection and dissemination and decision making.
3. Share information on disease surveillance projects used by other countries.
4. Assess laboratory capacity and systems for rapid and accurate detection of pathogens.
5. Assess capacity for linking laboratory tests to epidemiologic findings for prompt and effective public health response.

Methods:

- Review meetings w/ NICD, NIC, WB, ICMR, INCLEN, NPSP,WHO-India, USAID, CDC-India, FETP (see list of principle persons met)
- Field visits—Rajasthan, Tamil Nadu (health facilities from sub-center to district hospitals, private hospitals, laboratories, medical colleges, district and state surveillance units (see itinerary)

Principle persons met:

Dr. Anbumani Ramadoss, Honorable Union Minister for Health & Family Welfare
Mr. Naresh Dayal, Secretary, Ministry of Health and Family Welfare
Dr. Nirmal Kumar Ganguly, Director General, ICMR
Dr. S. Bhattacharya, Deputy Director General, ICMR.
Mr. Deepak Gupta, Additional Secretary, Ministry of Health and Family Welfare
Dr. Shiv Lal, Additional Director General & Director NICD
Dr. Ashok Kumar, Director Central Bureau of Health Intelligence
Dr. RL Ichhpujani, Additional Director and National Project Officer, IDSP
Dr. Shashi Khare, Consultant & HOD, Microbiology Division
Dr. Jagvir Singh, Joint Director, IDSP
Dr. Shah Hossain, Chief Medical Officer, IDSP
Mr. YK Sharma, Deputy Director General, National Informatics Centre (NIC)
Mr. Ram Khilari Meena Principal Secretary – Health, Rajasthan
Dr. J Revathi, Director, King Institute of Preventive Medicine, Chennai
Dr. Salim Habayeb, WHO Representative to India
Dr. Altaf Lal, Health Attaché, US Embassy, India
Dr. Rubina Imtiaz, CDC Country Representative, US Embassy, India.
Dr. Renu Lal, CDC-AI Coordinator, US Embassy, India,
Dr. Anil Jain, Clinical Trials Specialist, US Embassy, India
Dr. GNV Ramana, Public Health Specialist, World Bank
Dr. K Suresh, Consultant Epidemiologist, World Bank
Mr. Robert Clay, Supervisory Health Development Officer, USAID/India
Dr. Hamid Jafari, Director, National Polio Surveillance Project/WHO
Dr. Narendra Arora, Executive Director, INCLEN Foundation
Dr. Yvan Hutin, Medical Officer (Epidemiologist), FETP, WHO India

Itinerary

7-11 September: New Delhi, India: Ministry of Health and Family Welfare, USAID, CDC/India, Inclen, World Bank, National Polio Surveillance Project/WHO, WHO/India, NCID, NIC
11-12 September: Alwar District, Rajasthan: Lifeline Hospital, Alwar District Hospital, District Surveillance Unit, and NICD Branch
13-14 September: Jaipur District, Rajasthan : Mohanpura sub-centre, Tunga Primary Health Centre, Bassin Community Health Centre, Rukmini Devi Jaipuria Hospital, Rajasthan State Surveillance Unit, National Informatics Centre/Jaipur
14-16 September: Tiruvallore District and Chennai, Tamil Nadu: Tiruvallor District: Porur Primary Health Centre, Ulandai Community Health Center, District Headquarters Hospital , Chennai: King Institute of Preventive Medicine, Madrass Medical College, Infectious Disease Hospital
16-17 September: New Delhi, India: MoHFW, WB, NICD, and CBHI

Annex B. IDSP Tactical Issues

Observations

Core conditions:

There does not appear to be a clear consensus on what core conditions should be tracked through the IDSP. The syndromic surveillance and "probably cause" case detection as currently formatted provides a wide range of diagnostic possibilities but low specificity. Recent attempts by the CSU to discuss further refinements with other experts has produced a more specific list of 20 "notifiable" diseases. Although the list is still relatively extensive and overlaps with some of the disease control programs, this may provide progress in obtaining a more targeted approach in keeping with the focus on outbreak detection.

Case detection/analysis:

There are two main sources of information for detecting outbreaks: reporting by individual health care providers or pattern recognition of epidemiologic data by public health staff. In areas with at least minimum health staffing at the local level many outbreaks appear to be detected, particularly point source food outbreaks. However, this information is not always routinely being passed to public health authorities beyond the district level unless initial response is inadequate or the event attracts media coverage. In other situations, such as the recent cholera outbreak in Orissa, cases may be noted by local providers but not recognized as extraordinary or warranting a report. By the time reports do reach state or national attention, either through the media or uncontrolled local events, epidemics are probably at or near their peak and public health interventions may have limited effect.

To date, IDSP has not yet been able to demonstrate a significant impact on outbreak detection due to a combination of design limitations and slow implementation. Issues of human capacity, informatics capacity, and laboratory capacity are further discussed in separate sections. What appears clear is that there has been a simultaneous overabundance of data and major gaps in reporting. Development of software application to accumulate and aggregate data has far outstripped the development of analytic capacity often rendering meaningful analysis, especially for disease trends, problematic. However, clear gaps remain in gathering data from urban areas, the private sector, and even some public sector facilities.

Along with the relevant municipal corporations, IDSP is developing plans for urban surveillance in Delhi, Kolkata, and Chennai. These plans have not yet been implemented, but promise to address a key gap in data collection. Both here and in the rural public sector health facilities, the lack of a written diagnosis for the majority of patients will hamper efforts to pick up specific diseases.

Outbreak response:

Rapid response teams have been developed extensively at multiple levels; however, it is not clear what percent of outbreaks merit a response or the quality of investigations that do occur. Most responses at the sub-national level appear to be limited to testing suspected water or food and not focused on determining an etiology or conducting a

thorough epidemiologic analysis. The exception are those investigated by the FETP or national staff from NICD or ICMR.

Recommendations:

Core conditions:

- **Clearly prioritize identification of a limited number of "events of public health concern" w/ epidemic potential**

On the model of International Health Regulations (IHR), develop an "Indian Health Regulation" model which clearly defines events that may be of national public health concern or what should be detected (e.g. specific diseases, unknown/new pathogens, diseases prone to national/international spread). There will be certain state/regional variations that should be accommodated; however, for certain key diseases of national importance (e.g. AFP , unusual respiratory disease) there should be a mechanism for all states to provide an early warning. The list of diseases for consideration can be expanded depending on state capacity with the long term goal to have a list of diseases prioritized for national reporting.

Case detection:

- **Improve capacity for health care provider reporting of outbreaks**

A national call center may provide this opportunity; however, in order to ensure the appropriate prioritization and prompt response, there should be a separate channel allocated for health care providers. A critical important link is to ensure a direct feedback to a level which can provide an appropriate response. Additional sensitization through professional societies may be needed to publicize the effort and to gain acceptance from private physicians.

- **Further develop media scanning efforts, and/or develop partnerships for this purpose**

In recognition of the importance of the media in publicizing outbreaks, further efforts are needed at all levels to engage the media and establish a collaborative relationship. As noted, consideration should be given to hiring a communication specialist within the CSU at the national level. At the state and district level, direct links to district newspaper societies may facilitate communication. A more high tech approach would be to consider utilizing web searches for outbreaks in collaboration with organizations like Google and their new InSTEDD Project..

Strengthen strategic information collection

- **Address the gaps in current data collection by targeting key facilities, including infectious disease hospitals (public and private), large laboratories, and urban areas.**

In recognition that the first priority for IDSP is outbreak detection, initial efforts should focus on active surveillance of inpatient data, particularly from confirmed laboratory diagnoses. The proposed links to municipal corporation surveillance should be implemented, evaluated promptly, and expanded as feasible. Selected strategic ID hospitals in other states outside the initial 14 focus states could be added as soon as possible in order to provide a more comprehensive national picture.

Strengthen analysis/interpretation

- **The analytic capacity of the system could be strengthened by expanding the number of trained epidemiologist, developing appropriate software, and increasing the standardization and reliability of incoming data.** Consideration should be given to abolishing regular reporting on the S form on a pilot basis. Other pilot initiatives should be tried to encourage more complete recording of diagnoses from physicians.

Detecting disease outbreaks through pattern recognition will require enhanced analytic human capacity as well as a more consistence reporting of a manageable amount of data. Prototype software to aid data analysis at the local level should be evaluated and revised as necessary. Because syndromic data provides so much non-specific data, the usefulness of the S form in detecting outbreaks is marginal. On a trial basis, consider abolishing this reporting, but still emphasizing that local health care providers should continue their active house to house visitation and call in a suspicious increases in cases.

The current P form, which is a mixture of syndromic and clinical diagnoses, appears to yield only limited relevant information. Either due to the reporting burden or the lack of a clear clinical conclusion, most physicians fail to provide complete data. Analysis and interpretation of surveillance data from the district and PHC level will continue to be incomplete until diagnoses are documented. This problem can be partially addressed by revising the form to limit data collection to core conditions (as noted above). However, form revision can be highly disruptive to the ongoing system and should be undertaken only after extensive field testing of formats which encourage physicians to regularly record diagnoses (i.e. through the use of. tally sheets, etc).

Strengthen quality of outbreak response

- **CSU and the SSU should provide clear guidance as to expectations of outbreak reporting, including an expected format for first suspicions of an increase in cases.** Emphasis should be on early reporting and generating a quality response.

Clear guidance should be given as to when a suspected outbreak is to be reported to a higher level. The current First Information Report (FIR) needs to be modified to accommodate only the necessary basic information. CSU (perhaps w/ FETP) should systematically evaluate selected outbreaks according to standardized criteria and provide local feedback.

Establish regular feedback mechanisms

- **In addition to regular evaluation of outbreak investigations, the CSU should work with states to provide a regular bulletin on the status of communicable disease surveillance and outbreaks of national importance.** A regular national bulletin on a monthly or quarterly basis could incorporate aggregated data from disease control programs as well as inputs from the weekly state reports of communicable disease. Regular epidemiologic analysis of outbreaks could further motivate reporting as well provide training for local staff.

Annex C. Laboratory Capacity Strengthening

Background: Confirmation of outbreaks is a critically important component of an investigation and provides an evidence-based means of directing resources towards

further actions that might be required to monitor and control spread of cases. Although a difficult challenge, other health programs (e.g., Tuberculosis, Malaria, Polio, and HIV) have been successful in India in creating this link between field epidemiology and laboratories. Individual laboratories, such as the Government Hospital for Thoracic Medicine in Chennai have been transformed into one of India's Centers of Excellence for not only laboratory work, but for clinical training as well. Both polio and tuberculosis programs have created a tiered network of laboratories with rigorous quality assurance practices that regularly provide reliable diagnostic information to guide programmatic efforts. These examples demonstrate what can be done to develop laboratory capacity.

Assessment Observations:
The current health system provides diagnostic capacity through various state and national government public health laboratories as well as through multiple private laboratories. Due to a lack of integration of these laboratory services, there are no good estimates of number of health laboratories or the quality of work being performed. In addition, information systems have not been developed for laboratories, particularly in the public sector. Accessioning of specimens, tracking specimens through the laboratory, and test reporting are handwritten.

In order to upgrade laboratories in a way that enables rapid scaling to address new problems, it is necessary to look at the broad infrastructure issues that include administration and organizational structure, credentials and education of critical positions in the laboratory (e.g., laboratory director), facilities/utilities, safety, waste disposal, staffing, test menu, specimen transport and accessioning, development of procedure manuals, quality assurance, and equipment maintenance.

There have been advantages and disadvantages to developing laboratory services for specific categorical programs,. In both the malaria and AFB microscopy programs, there is an understanding of the importance of external quality assurance, but that same understanding has not always been extended to other testing (e.g., hematology, chemistry, immunology, bacterial culture) performed in the same laboratory. The existence of multiple vertical programs that function well may allow the same principles to be extended to other laboratory test procedures during implementation of the integration program.

National laws/policies governing practice of laboratory medicine - There are currently limited laws in place governing laboratory practice. The MoHFW reportedly intends to submit a proposed law that initially provides for "registration" of all laboratories as a starting point to determine the number of laboratories in the country. In the two years following registration, laboratories would be required to meet yet to be determined standards. The need for such a system has been noted in previous assessments as well and is welcomed as a positive step.

Facilities– Many district and even state public health hospital laboratories will require upgrading (e.g., appropriate flooring and tiling on walls). Electrical supplies are intermittent and essential equipment must be provided with uninterruptible power supplies.

Staffing –Two aspects of laboratory staffing must be addressed: supervisory staffing and technical staffing. Public health officials have voiced support for integrating district public health and clinical laboratories to minimize redundancy and to maximize the opportunities brought about by great depth of staffing. In addition, the government is taking steps to allow MSc microbiologists to be "directors" of laboratories; this is another positive step since these individuals have the technical microbiology skills. The requirement for MD microbiologists is not necessary so this change in policy will greatly expand the pool of candidates for these critical positions.

At the national level, the need for additional laboratory staff is also critical. The National Project Officer for IDSP is an MD microbiologist but he is also responsible for overall project implementation. National leadership to develop a comprehensive network of laboratories will require a dedicated laboratory position within the CSU. Additionally, during the initial phases of expansion (i.e. the next two years) other positions will be required to develop regional/state/district laboratory services.

Specimen Transport– Since peripheral and rural laboratories will be providing minimal testing, the development of rapid and efficient transport systems for microbiology services will be important. The system will require the use of an "attendant" to carry specimens from the periphery to the central laboratory as well as the appropriate transport media and intact reverse cold chain. The polio laboratories should be examined as a model for the specimen transportation process.

Specimen Handling (accessioning/tracking) - Specimen accessioning is accomplished by a numbering system developed independently in each laboratory. A number or name on the request form is transposed to a specimen container. Numbers are handwritten as opposed to the use of pre-numbered adhesive labels. As quality assurance measures are implemented, a consistent system for specimen tracking must be developed.

Diagnostic Reagents/Kits – The few systems of validation of test kits are varied and, in most cases, kit validation is not performed. Developing a national focal point for performing kit validation would be a major step forward which will relieve the burden of this requirement from the local laboratories.

Quality Assurance - A national institution with the appropriate background and experience should oversee quality assurance functions and provide training, monitoring and evaluation of quality assurance practices in all laboratories. Lessons learned from the tuberculosis and polio programs in India as well as the experiences of other countries (e.g., Thailand) should be included in any decision making processes.

Hazardous Waste/Biosafety - Although national legislation has been passed related to medical waste disposal, the law has not been consistently implemented across the country. Laboratories producing waste have options varying from autoclaving followed by incineration or developing contracts with carriers to remove waste that is not incinerated.

Conclusions and Recommendations:

Reasonable time frames for development of laboratory capacity – The time required for development will be dependent on the system that is proposed. For example, an initial model utilizing a regional approach (e.g., eight laboratories), can be implemented rapidly. Developing many district laboratories with appropriate quality assurance will take much longer. Our recommendation would be to consider development in the first two years of a small number of state laboratories that can also act as regional reference laboratories for other states and districts. Experiences from these pilots can be used for a follow-up expansion to other state and district laboratories

Expanding Capacity of State Public Health Laboratories: Control of diseases of public health importance in India requires the support of laboratories with the capability of bacterial culture. Upgrading facilities and providing technical expertise should be limited to a small set of state public health laboratories and rarely to district laboratories. Specimens (patient, food specimens, etc.) for bacterial culture must be collected properly and transported to an appropriate state laboratory. This proposal does not suggest to neglect district needs, but allows a more reasonable approach and higher likelihood of success for development of a national system.
Specific next steps include:

- Develop a process and identify states to be selected for upgrading to provide bacteriology culture services.
- In each selected state, define a process and identify categories of facility upgrading including specific infrastructure requirements and estimated cost).
- Identify equipment required for diagnosis of specific disease agents of interest.

Management and Administrative Structure: The director of the state public health laboratory should be the designated as the State Laboratory Director with responsibility of general oversight, quality assurance and training for district laboratories. .

Quality Assurance (QA): A training program for quality assurance can be implemented with the participation of appropriate partners. Training for specimen collection and transport for district laboratories can be provided in a central setting at the state level. Evaluation of training programs should include pre- and post-test evaluations as well as on-site evaluations to determine changes in practice. Follow up can be provided from a national level if appropriate staff are assigned and trained.
Specific next steps include:

- Train the trainer program– A CDC/American Public Health Laboratories program could be conducted in each state for the medical institutes responsible for QA. Consider sending two-three individuals who would have responsibility for developing the Quality Systems Program to the U.S. (or other country willing to provide such training).

Laboratory Information System- In addition to the installation of laboratory information systems, input from laboratorians will be important in the development of the IDSP informatics system. Again, the AFP surveillance system may provide a useful model.

National Leadership and Convergence: In addition to NICD, other agencies (such as ICMR) potentially have much to offer with respect to development of a public health

laboratory system. In order to maximize these inputs, it is essential that central leadership be provided to clearly define roles, assure synergy, and reduce redundancy.

Possible roles for national institutions include:

- NICH: Primary responsibility for overall implementation of the IDSP
- National Accreditation Board for Testing and Calibration Laboratories (NABL): Leadership in providing accreditation
- ICMR: Support for specimen transport/handling/reference diagnostics, reagent production, kit validation, training programs

(One of the above could also develop a training program for laboratory equipment maintenance and repair for state laboratory engineers.

- National disease control programs (polio, etc.) - Provide quality assurance training and assist with development of specimen transportation systems and other aspects of laboratory upgrading where their experience can be utilized.

Specific next steps include:

- Based on central leadership guidance, develop written memorandum of understanding between the States and the various national institutes and academic medical colleges regarding the provision of reference services.

Annex D. Strengthening Informatics Capacity

Organization and Governance

We recommend that IDSP establish an "IDSP Informatics Workgroup" (IDSP-IWG) comprised of programmers, epidemiologists/physicians and data managers from the CSU/IDSP and the National Informatics Center (NIC). The IDSP-IWG could meet on a weekly basis to provide guidance and recommendations to address issues related to the data model, data management, data quality assurance, data analyses, and usability issues. There is a need for the CSU to identify someone who can serve as a liaison between NIC and IDSP to gather system requirements for the IDSP Reporting System (software application). This person would be a key member of the workgroup and could also serve as an analyst to give recommendations for technical specifications/requirements, usability analysis, and technical documentation for the software system.

In order to facilitate convergence of data from existing vertical programs such as polio, malaria and HIV, we recommend that IDSP develop a protocol for periodic data sharing (e.g., weekly or monthly, depending on the program) from those programs to the CSU. The protocol would include a process for conversion and importation of aggregated data from those programs to the IDSP Reporting System data format.

The CSU could create a secure website (similar to an FTP site) to be used to place all critical documents pertaining to the program operations. This website would facilitate sharing of documents and data.

Software Application Development and Maintenance

In accordance with informatics best practices, we recommend that IDSP and NIC maintain a current data model (i.e., documentation of data flow, database structure, data transmission, etc.), data dictionary for all variables, and a complete technical and operations manual of the software application. Disease-specific triggers have already been determined by IDSP and these thresholds should be built into the software system. IDSP can develop and maintain validation of rules for triggers and provide a mechanism to modify triggers based on state requirements. NIC has excellent Geographical Information Systems (GIS) resources. IDSP can leverage those resources by including GIS mapping analyses in the IDSP software.

The IDSP-IWG should develop a clear timeline for finalization of specifications and requirements, software development, piloting and deployment. Recognizing that some work has already been completed, it is advisable for IDSP-IWG to take a fresh look at the beta version of the reporting software in case changes are needed based on the recommendations of the workgroup. The IDSP-IWG should also develop a clear plan for piloting the software in selected districts with varying capacities; the software should not be tested only in the highest performing districts. During the pilot phase districts and states should be required to provide weekly feedback on usability, reporting any problems with the software or connectivity. They can use a standardized feedback form each week for this. The pilot should allow for full cycle reporting, with data entry, cleaning and analysis being done by district and transmission to state with appropriate data management processes.

IDSP-IWG is recommended to create a set of Standard Operating Procedures (SOPs) for state and district offices. The SOPs would provide clear instructions for timelines for data entry and reporting, for backing up datasets, and for conducting data cleaning and analysis procedures.

We recommend that IDSP develop a set of automated and standardized IDSP national reporting formats for monthly feedback reports, built into the software. These feedback reports can include analysis of reporting quality (timeliness and completeness of reporting) and surveillance quality indicators. This automated report can be distributed to a list of authorized individuals. Monthly feedback can be provided from national level to state level, and from state level to district level.

Deployment and training

Once the software has been developed IDSP/NIC should provide software usage training at district level. The training should cover all aspects of the software, including data entry, data cleaning, data analysis, report production, and data transmission. Basic troubleshooting should also be included in the training. All training materials should be included in a hard-copy manual/user guide. The user guide should also be accompanied by a hardcopy of the Standard Operating Procedures.

Training at district level should also cover basic epidemiology so that district staff can properly interpret the analysis outputs generated by the software. IDSP can develop a strategy and implementation plan to emphasize the need for appropriate and routine use of data. District staff should be encouraged to periodically print certain important analysis outputs and display publicly within the office. Also, IDSP should consider holding annual regional conferences for state level offices to share their data analyses/findings. This could strengthen regional cooperation and help create a culture of information sharing for data analysis and interpretation.

Once the software system has been deployed and there is regular data flow from district to state and state to central level, the IDSP central office can create and manage a set of automated simple shell tables for select diseases. These tables could be distributed in a report to partner agencies within and outside the MoHFW.

We recommend that IDSP monitor and evaluate the informatics systems on a regular basis to identify gaps in reporting due to technological issues such as software malfunction or connectivity.

Current data management staffing at the national level is probably insufficient to handle the amount of data which is expected once the information system is developed. The IDSP-IWG could make recommendations on the number of staff needed to manage the data.

As stated in earlier reports, IDSP is advised to accelerate the hardware procurement and installation process to complete the installation process of the Phase I and II states. NIC should also consider performing a periodic full load-test and full cycle test on the IDSP-based satellite and broadband connections.

Call Center/s

While the IDSP leadership has substantial interest in deploying fully operational Call Centers, we would recommend that substantial planning needs to be completed prior to their launch.. A clear and well articulated scheme to triage calls from the general public and health care providers should be developed. Planning should include a detailed workflow process and an operations plan for Call Center/s to primarily focus on the outbreak response model and to respond adequately to outbreaks. There should be simple analytic tools as part of the system which can coordinate the data collection and dissemination process from Call Center/s to the IDSP Reporting System. Software can be developed to provide an alert notification process such that local public health system and Rapid Respond Teams can respond to the needs and take action. Ideally, this software could include a GIS interface to rapidly detect the location of a potential outbreak and assist in deploying a proper response. Initiation of call centers should augment but not replace the development of local data collection and analysis as detailed elsewhere in the report.