Chapter-2
Concept of Surveillance
&
Review Literature
SURVEILLANCE

Epidemiologic surveillance is the ongoing systematic collection, analysis, and interpretation of health data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know. The final link in the surveillance chain is the application of these data to prevention and control. A surveillance system includes a functional capacity for data collection, analysis, and dissemination linked to public health programs.

Health surveillance is the ongoing systemic collection, analysis and interpretation of health essential for planning, implementing, and evaluating public health activities, closely integrated dissemination of the data to enable effective and efficient action to be taken to prevent a disease.

William Farr (1807-1883) is recognized as the founder of the modern concepts of surveillance. Public health surveillance has focused primarily on infectious diseases. The Public Health Service (PHS) to collect morbidity reports for use with quarantine measures against pestilential diseases such as cholera, smallpox, plague, and yellow fever. Current concepts of public health surveillance have evolved from public health activities developed to control and prevent disease in the community.

GOALS SURVEILLANCE:

The goals of surveillance often differ at different levels of the public health system. Surveillance data are used to allocate resources and evaluate the impact of control and prevention strategies and programs.
at all levels. However, at the local level the use of surveillance to trigger in investigation and control activities predominates for infectious diseases and environmental hazards. In contrast, monitoring for trends, measuring the effectiveness of specific interventions, and conducting research to elucidate risk factors predominate at the national level. State public health agencies typically share both perspectives. Local public health agencies utilize chronic disease and maternal and child health data much like state and national agencies but have the added challenge of small area analysis with limited epidemiologic capacity.

**Surveillance data used:**

1. Recognize cases or clusters of cases, to trigger interventions to prevent transmission or reduce morbidity and mortality (includes the special case in which surveillance at the national level is required to recognize multi-state clusters).
2. Identify new health problems and emerging diseases.
3. Assess public health impact of health events or determine and measure trends.
4. Measure causal factors in disease (risk factors) to initiate actions to prevent the onset of disease.
5. Demonstrate the need for intervention programs and resources, and allocate resources during health planning.
6. Monitor effectiveness and evaluate the impact of prevention and control measures, intervention strategies, and health policy changes.
7. Identify high-risk population groups or geographic areas to target interventions and guide analytic studies.
8. Provide data for research, and develop hypotheses that lead to analytic studies about risk factors for disease causation, propagation or progression.

9. Measure progress toward Millennium Development Goals, or other project or program goals, including PRSP (Poverty Reduction Strategy Paper) targets\textsuperscript{32,33}.

**The key Elements of surveillance system:**

All surveillance system involve six key elements:

- Detection and notification of health event
- Investigation and confirmation (Epidemiological, clinical, laboratory)
- Collection of data
- Analysis and interpretation of data
- Feed back and dissemination of results

Response a link to public health programme specially action for prevention and control\textsuperscript{15}. 
Example of levels at which surveillance functions might be performed in a country.

<table>
<thead>
<tr>
<th>Functions</th>
<th>Central Level</th>
<th>Intermediate Levels</th>
<th>Point of Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection of cases and notification</td>
<td>-</td>
<td>-</td>
<td>Yes</td>
</tr>
<tr>
<td>Collection and consolidation of data</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Analysis and routine reports</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Investigation and confirmation of cases/outbreaks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Epidemiological</td>
<td>-</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>• Clinical</td>
<td>-</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>• Laboratory</td>
<td>Yes</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>Feedback (to more peripheral levels)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Feed-forward (to more central levels)</td>
<td>Yes</td>
<td>No</td>
<td>-</td>
</tr>
</tbody>
</table>

**Source:** WHO, Geneva, 1999

The level at which a specific function would be carried out varies by country. The table above is just one example.32
## Surveillance Methods

| Reportable by clinicians or health care facilities | • Require immediate public health response; or  
| | • Recognizable solely by clinicians. |
| Reportable by laboratories | • Immediate public health response NOT needed;  
| | • Laboratory test needed for recognition or to meet case definition;  
| | • Laboratory test adds relevant information (e.g. Salmonella serotype, antibiotic susceptibilities for tuberculosis and pneumococcus, cell type for cancer).  
| | • As a back-up to clinician reporting. |
| Representative sentinel surveillance | • Designed so findings can be generalized to specified population.  
| | • Convenience sampling;  
| | • To generate hypotheses regarding risk factors;  
| | • To evaluate the effectiveness of a public health or clinical intervention (e.g. National Nosocomial Infection Surveillance System, Hepatitis Sentinel Counties); or  
<p>| | • To collect limited information to recognize the onset, termination, and |</p>
<table>
<thead>
<tr>
<th>Secondary analysis of datasets collected for other purpose</th>
<th>characteristics of a particular public health problem of limited duration (e.g. influenza) or that is new.</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Places no additional burden on public health surveillance system sources;</td>
<td>- Places a minimal burden on public health programs if the data are already assembled;</td>
</tr>
<tr>
<td>- Places a minimal burden on public health programs if the data are already assembled;</td>
<td>- Costly if data must be assembled by public health;</td>
</tr>
<tr>
<td>- Costly if data must be assembled by public health;</td>
<td>- Data may be of limited quality;</td>
</tr>
<tr>
<td>- Data may be of limited quality;</td>
<td>- Care must be taken in analysis and interpretation;</td>
</tr>
<tr>
<td>- Care must be taken in analysis and interpretation;</td>
<td>- Immediate public health response NOT needed;</td>
</tr>
<tr>
<td>- Immediate public health response NOT needed;</td>
<td>- To assess the public health impact or monitor trends;</td>
</tr>
<tr>
<td>- To assess the public health impact or monitor trends;</td>
<td>- To measure morbidity and health system costs due to chronic or recurrent health events;</td>
</tr>
<tr>
<td>- To measure morbidity and health system costs due to chronic or recurrent health events;</td>
<td>- Potential data source include hospitals discharge, managed care encounter, billing, insurance, emergency room, school/work attendance, and environmental monitoring data, immunization registries, work-site injury and death reports, and law</td>
</tr>
</tbody>
</table>
| **Periodic or ongoing prevalence surveys** | enforcement records.  
- To assess prevalence trends over time (e.g., HIV seroprevalence surveys, NHIS, BRFSS, NHANES).  
- Optimal if designed to be useful to state and local health agencies and managed care organizations. |
| **Vital records** |  
- For surveillance of births and deaths;  
- May be used alone for some analytic studies because essentially all vital events for the entire population are recorded as well as some risk factor information;  
- Under preview of the Association of Public Health Statistics and information systems. |
| **Temporary surveillance** |  
- Any method of surveillance;  
- To assess public health impact;  
- To evaluate the effectiveness of public health or clinical intervention; or  
- To develop hypotheses about risk factors. |

Active System and Passive System:

The passive system was already in place and consisted of unsolicited reports of notifiable diseases to the district offices or state health department.

The active system was implemented in probability sample of physician practices. Each week, a health department employee called these practitioners to solicit reports of selected notifiable disease.\textsuperscript{34}

Important points to consider during determination of Surveillance Data Source:

Three important points should be taken into consideration during determination of surveillance data source.

1. Cost, it should not be costly.
2. Stability of surveillance system.
3. If the intended system helps in achieving the objectives.\textsuperscript{33}

Parameters for adjustment of priorities of surveillance

Parameters for measuring the importance of a health related event and therefore the public health surveillance system with which it is monitored can include.\textsuperscript{35}

- Indices of frequency: The total number of cases and/or deaths, incidence rates, prevalence, and/or mortality rates, and summary measures of population health status quality-adjusted life years [QALYS].
- Indices of severity: bed-disability days, case-fatality ratio, and hospitalization rates and/or disability rates.
- Disparities or inequities associated with the health related event.
• Costs associated with the health-related event.
• Preventability.\textsuperscript{36}
• Potential clinical course in the absence of an intervention (vaccinations).
• Public interest\textsuperscript{37,38}.

Efforts have been made to provide summary measures of population health status that can be used to make comparative assessments of the health needs of populations\textsuperscript{39}. Perhaps the best known of these measures are QALYs, years of healthy life (YHLs), and disability-adjusted life years (DALYs). Based on attributes that represent health status and life expectancy, QALYs, YHLs, and DALYs provide one-dimensional measures of overall health. In addition, attempts have been made to quantify the public health importance of various diseases and other health-related events. In a study that describes such an approach, a score was used that takes into account age specific morbidity and mortality rates as well as healthcare costs\textsuperscript{40}. Another study used a model that ranks public health concerns according to size, urgency, severity of the problem, economic loss, effect on others, effectiveness, propriety, economics, acceptability, legality of solutions, and availability of resources\textsuperscript{41}.

**Case definition**

A public health surveillance system is dependent on a clear case definition for the health-related event under surveillance\textsuperscript{35}. The case definition of a health-related event can include clinical manifestations (symptoms), laboratory results, epidemiologic information (person, place, and time), and/or specified behaviors, as well as levels of
certainty (confirmed/definite, probable/presumptive, or possible/suspected). The use of a standard case definition increases the specificity of reporting and improves the comparability of the health-related event reported from different sources of data, including geographic areas. Case definitions might exist for a variety of health-related events under surveillance, including diseases, injuries, adverse exposures, and risk factor or protective behaviors.

**List of notifiable disease**

The list of nationally notifiable infectious diseases is revised periodically. A disease might be added to the list as a new pathogen emerges, or a disease might be deleted as its incidence declines. Public health officials at state health departments and CDC collaborate in determining which diseases should be nationally notifiable. CSTE, with input from CDC, makes recommendations annually for additions and deletions. WHO suggest 22 communicable diseases, four non-communicable diseases and seven risk factors non-communicable diseases for intergrades surveillance to be built in a phased manner by the end of this decade. Member countries are expected to adapt the list to suit the local epidemiological profile, taking into consideration national, regional and international perspective. The suggested disease and risk factors are as given hereafter:

1. Acute Flaccid Paralysis
2. AIDS
3. Chicken pox
4. Cholera like diarrhea
5. Diphtheria
6. Dysentery
7. Encephalitis
8. Fever syndrome more than 6 days
9. Hemarragic fever
10. Hepatitis
11. Herpes zoster
12. Leprosy
13. Malaria: falciparum and vivax
14. Measles
15. Meningitis: non-pyogenic and pyogenic
16. Mumps
17. Rabies
18. Rheumatic fever
19. Tetanus neonatorum
20. Tetanus in older age
21. TB in older age and pulmonary
22. Whooping cough
23. Any other of public health importance

**Data need for surveillance system**

Sources should be matched to surveillance goods data source and surveillance methods must be carefully selected to match the specified goals of surveillance and to maximize the attributes timeliness, sensitivity, positive predictive value, simplicity, flexibility of greatest importance at each level of the public health system for each health event or determinant. Data that is not needed should not be collected unless it is more efficient to collect a standard set of easily attainable data for a group of health events or determinants. Data should be
collected in the least labor-intensive manner possible consistent with the quality, scope, and detail needed. An efficient surveillance system is one in which minimal provider or local or state public health resources are expended to collect information they will not use. For each health event or determinant under surveillance, the surveillance methods selected should be those that are the most appropriate for each level of the public health system based on the goals at that level, available resources, and the most efficient sources of data.

Mechanism for use reports of notifiable diseases

NETSS, CDC receives the reports of notifiable diseases by e-mail, telephone and fax mail from a local area, state and country health department. Clinical laboratories also report results consistent with reportable diseases.

Methods of analyzing data of surveillance:

Devising frequency table, drawing chart and designing map is useful for data analysis, based on collected data, it is possible to calculate specific data for which data surveillance system has already been collected and overall method for data analysis can be done manually or by computer software.

Method of dissemination of surveillance data

The public health surveillance system should operate in a manner that allows effective dissemination of health data so that decision makers at all levels can readily understand the implications of the information. Options for disseminating data and/or information from the system include electronic data interchange; public-use data files; the Internet; press releases; newsletters; bulletins; annual and other
types of reports; publication in scientific, peer-reviewed journals; and poster and oral presentations, including those at individual, community, and professional meetings. The audiences for health data and information can include public health practitioners, health-care providers, members of affected communities, professional and voluntary organizations, policymakers, the press, and the general public.

The most important attitudinal problems of providers and reporters of data surveillance system:

1. Lack of trust in the fact that their reporting as well as observing rules and regulations in this regard can result in fundamental changes in health status of society.
2. Lack of potential stability in political and health messages.
3. Over monitoring and descending hierarchical relationship.
4. False attitudes in occupational confidentiality.

The relationship between laboratories and surveillance system:

Laboratories play an important role in prevention of diseases. Laboratory staffs are main colleagues in surveillance system. Clinical Diagnosis in most cases require laboratory confirmation. A complete and integrated surveillance system has a laboratory correlation in local, state and national level and acts as an integrated network in these levels.

Confidentiality and Accessibility to data:

Surveillance system and back up of information system should be designed in a way that personal information should be accessible only to permitted individuals. There should be sound policy and transparent written regulations and instructions in this regard, and manual and
electronic date file must be protected. Data should be classified so that no irresponsible individual can trace the patients.

**What Software Is Available for Surveillance?**

There are numerous software packages available for use in public health surveillance. Many of them are complex and are aimed primarily at statistical analyses of datasets. Several easy-to-use software packages are widely accepted in the surveillance community.

**Epi-Info**

Epi-Info and Epi-Map (Centers for Disease Control and Prevention) are public domain software packages designed for the global community of public health practitioners and researchers. Both provide easy form and database construction, data entry, and analysis with epidemiologic statistics, maps, and graphs.

**Prophet**

Prophet offers advance, easy-to-use software tools for data management, visualization, and statistical analysis.

**Gideon**

GIDEON, created by C.Y. Informatics, is an interactive computer program for diagnosis and reference in the fields of tropical and infectious diseases, epidemiology, microbiology, and antimicrobial chemotherapy.

**Key concepts of statistics for surveillance system:**

Statistics and epidemiology is the cornerstone of health-care. Therefore, it is vitally important to offer proper training and pay due attention to minimum statistical indicators. Some of the indicators
which should be taken into consideration as minimum statistical indicators are as follows:

It should noted that collected data set should be devised in a way that it could meet assessment requirements of these indicators. Sensitivity rate, characteristics, systemic errors, predictive validity and finally Disability Adjusted Life Years (DALY), Years Last to Disability (YLD), Years of Lost Years (YLY)³³.

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- Collection of data
- Analysis and interpretation of data
- Feed back and dissemination of results
- Response a link to public health programme specially action for prevention and control³³.

**Organization, policies and disease of surveillance system:**

The exact number of diseases which need obligatory reporting should be available and their published list should be accessible to the provider of healthcare. Meanwhile, considering the needs which have arised, the list should be edited periodically and in case of necessity, a disease is added or is left out. Diseases definitions and reporting method must be explicit. Clear definitions of tasks and duties concerning the whole three-management level: local, state, and
national level is also virtually important. Reporting processes should be devised in a way to meet needs at local, state and national level and reinforce coordination during them.

**History of Surveillance**

The first public health use of surveillance was in the Republic of Venice in the 14th century. At that time, public health authorities boarded ships to identify persons ill with bubonic plague and related symptoms and to prevent them from disembarking. In 1741, Rhode Island required tavern keepers to report patrons with smallpox, yellow fever, and cholera to local authorities. Statewide efforts began in Massachusetts in 1874. At that time, a voluntary, postcard reporting format was used to provide weekly reports on prevalent diseases. In 1878, Congress authorized the forerunner of the United States Public Health Service (PHS) to collect morbidity data for use in quarantine measures against “pestilential diseases” such as cholera, smallpox, plague, and yellow fever.

Compulsory reporting of infectious diseases began on a national basis in Italy in 1881, and in other European countries shortly afterwards. Michigan was the first U.S. state to require reporting of specific infectious diseases, in 1893. In that same year, Congress enacted a law to provide for the collection of information each week from state and municipal authorities. By 1901, all states required “notification” and included smallpox, tuberculosis, and cholera. The list of notifiable diseases has changed over time, but the basic strategy remains in place.

Worldwide eradication of smallpox became possible in the 1970s because of a surveillance-vaccination approach. Earlier efforts to
immunize nearly 100 percent of the population failed because of logistical difficulties. The successful “ring strategy” relied on intensive surveillance to identify cases, isolation of all known cases, and immunization of individuals who may have come in contact with cases. Based on this experience, a modified version of this approach is currently being proposed by the Centers for Disease Control and Prevention (CDC) as a national strategy for terrorist-initiated smallpox attacks.

Thus, from the start, surveillance was focused on detecting individual cases and taking action regarding the affected individuals. Control strategies include monitoring, treatment, quarantine, and contact tracing. In the United States, infectious disease surveillance (as with most public health activities) is constitutionally viewed as a state responsibility. Since the U.S. Constitution is silent with respect to health, public health is dealt with as part of the “police powers” of the state. As a result, for instance, the list of notifiable diseases varies from state to state, even to this day. The interstate commerce clause of the Constitution, however, has allowed for some federal-level efforts, especially with regard to protecting the country from infections from abroad. The basic mechanisms of case surveillance (postcard reporting to local health departments, weekly summaries in the Morbidity and Mortality Weekly Report, and so on) were established in the 19th century, and are generally still in place in the 21st. There are few cases these days of “pestilential diseases” for which immediate action is necessary, but the need for quick action to prevent the spread of infectious diseases does remain. For tuberculosis (TB) and STDs, for instance, one of the main goals of surveillance is to identify
infectious individuals before they infect others and thus to prevent an exponentially growing epidemic. Case surveillance has received additional prominence along with the increasing interest in emerging infections and, since 9/11, in bioterrorism. The development of electronic reporting systems utilizing the Internet (CDC's National Electronic Disease Surveillance System (NEDSS)) is under way but not yet implemented except in a few states.

Surveillance also has a history as a statistical activity, although the term "surveillance" was not applied until the mid 20th century. In this perspective, surveillance focuses on disease in populations rather than in individuals. The earliest statistical surveillance activities made use of vital statistics, primarily derived from death certificates. The analysis of vital statistics began with von Leibnitz and Graunt in the 17th century and was extended to examine cause of death and applied to public health in the 19th century by Farr in England and Shattuck in the United States. The coverage of vital statistics became complete in the United States in the 1930s. It is now coordinated by the National Center for Health Statistics but is still a state activity.

Statistical surveillance also includes health surveys based on scientifically chosen sample surveys. The first national health survey was conducted in the United States in 1935, and the National Health Interview Survey (NHIS) has been in continuous operation since 1957. In the 1990s, the CDC developed the Behavioral Risk Factor Surveillance System (BRFSS), a model for state population health surveys, and all states and the District of Columbia now use it. In addition, many special purpose surveys are now available and commonly used.
Registries are another source of data for statistical surveillance. The National Cancer Institute (NCI) Surveillance, Epidemiology, and End Results (SEER) system, which operates in eleven population-based cancer registries and three supplemental registries covering approximately 14 percent of the U.S. population, uses active surveillance methods to record all incident cases of cancer as well as their treatments and outcomes. As a result, NCI is able to estimate cancer incidence and survival rates, something that is not possible for most chronic diseases. Registries exist for other (primarily rare) conditions, but with limited coverage.

The use of medical and administrative records to analyze the utilization and outcomes of health care, sometimes known as "outcomes research," is another form of statistical surveillance. Increasingly popular in the last few decades, outcomes research includes efforts to study health care access and utilization in small areas, as well as performance measurement and quality assessment. The extension of the original focus of surveillance from infectious diseases to other aspects of public health paralleled developments in our understanding of the determinants of health and of public health itself. The original focus in vital statistics on all-cause mortality in the 17th century expanded to cause-specific mortality in the 19th century as more became known about the causes of disease. In the second half of the 20th century, public health and surveillance began to focus on chronic diseases, and simultaneously on health risk factors as well as health care utilization, costs, outcomes, and so on. In 1979, Healthy People brought attention to community health indicators, performance measures, and so on, and surveillance efforts of this type
have increased with publication of Healthy People 2000 and Healthy People 2010. Surveillance of occupational morbidity and mortality, developed in concert with new regulations on workplace safety regulation, and injury surveillance became more common in the 1990s as public health turned its attention to intentional and unintentional violence. A growing focus on health care quality in the early 21st century and attendant concerns about medical errors and iatrogenic injuries in recent years, have led to intensified surveillance efforts, along with post-marketing surveillance for medical, especially vaccine, side effects. Despite a variety of national surveillance efforts, Birkhead and Maylahn (2000), borrowing from former House Speaker Tip O'Neill, appropriately argue that "all surveillance is local." The reason is twofold. First, as noted above, the authority for public health, and hence for surveillance, lies with the states. Second, the impetus for this authority is the need to prevent and control specific health problems in the local community. State and local authorities, because of their proximity to the population, best carry out these functions. Moreover, Birkhead and Maylahn argue, "surveillance is synonymous with control to many public health professionals, policy makers and legislators at the state and local level, and to members of the public." The increasing attention to community-level determinants of health (social and physical environment) has led states and local areas to gather and report noninfectious disease data such as community health reports, performance measures, and so on, at the "community" level.
Central level

Regional/International level

Periipheral level

Intermediate level

Clinical (suspected)

+ Supportive laboratory data
+ epi link (probable)

Diagnostic Laboratory (confirmed)

Regional reference laboratory
REVIEW OF LEATRUTURE

Huang W. and Hou W.T. (2007) in this study, "Design and prototype of a mechanism for active on-line emerging/notifiable infectious diseases control, tracking and surveillance, based on a national healthcare card system", reveal that timeliness is a critical issue in preventing the spread of emerging/notifiable infectious diseases, such as severe acute respiratory syndrome (SARS) or avian influenza (bird flu). Current computerized surveillance systems in many countries have demonstrated their usefulness in detecting specified communicable diseases. However, the off-line, daily or weekly data reporting mode induces a time lag in data collection, transmission, processing, and responses. This paper proposes an on-line real-time mechanism, named EDICTS, for emerging/notifiable infectious diseases control, tracking and surveillance. It is based on the on-line health IC card system and works at the registration process of primary care practices and emergency departments. Hence, should a disease defined by CDC be detected at the registration station, EDICTS responds in real time. Note that EDICTS is a mechanism; it is CDC that determines the policy and activates it. A prototype is designed and implemented on a simulated environment of the Taiwan's national health insurance IC card system. The proposed policy and rules are defined according to the CDC regulations. Timely, sensitive and cost-effective, EDICTS complements the existing successive level of CDC reporting system as a fast-response control channel.
Mc Nabb S. et al (2002) investigated, the "Conceptual framework of public health surveillance and action and its application in health sector reform" initiated meetings at regional and national levels to assess and reform surveillance and action systems. These meetings emphasized improved epidemic preparedness, epidemic response, and highlighted standardized assessment and reform. To standardize assessments, the authors designed a conceptual framework for surveillance and action that categorized the framework into eight core and four support activities, measured with indicators.

The result showed that in application, country-level reformers measure both the presence and performance of the six core activities comprising public health surveillance (detection, registration, reporting, confirmation, analyses, and feedback) and acute (epidemic-type) and planned (management-type) responses composing the two core activities of public health action. Four support activities – communications, supervision, training, and resource provision – enable these eight core processes. National, multiple systems can then be concurrently assessed at each level for effectiveness, technical efficiency, and cost. This approach permits a cost analysis, highlights areas amenable to integration, and provides focused intervention. The final public health model becomes a district-focused, action-oriented integration of core and support activities with enhanced effectiveness, technical efficiency, and cost savings. This reform approach leads to sustained capacity development by an empowerment strategy defined as facilitated, process-oriented action steps transforming staff and the system. 
Curtis L et al (1996) explored the "Surveillance for Pneumonic Plague in the United States during an international emergency: A Model for Control of Imported Emerging Diseases". The summary of their study reveals that in September 1994, in response to a reported epidemic of plague in India, the Centers for Disease Control and Prevention (CDC) enhanced surveillance in the United States for imported pneumonic plague. Plague information material were rapidly developed and distributed to U.S. public health officials by electronic mail, facsimile, and expedited publication. Information was also provided to medical practitioners and the public by recorded telephone messages and facsimile transmission. Existing quarantine protocols were modified to effect active surveillance for imported plague cases at U.S. airports. Private physicians and state and local health departments were relied on in a passive surveillance system to identify travelers with suspected plague not detected at airports. From September 27 to October 27, the surveillance system identified thirteen persons with suspected plague; no case was confirmed. This coordinated response to an international health emergency may serve as a model for detecting other emerging diseases and preventing their importation.

Sandra Reosh S. (1999) in her study on 'Mandatory Reporting of Diseases and Conditions by Health Care Professionals and Laboratories'. described the state and territorial reporting requirements for diseases and conditions recommended for national public health surveillance. The results showed that the 58 diseases and conditions recommended for national reporting, 35% (60%) were reportable in greater than 90% of the states and territories, 15 (26%) were reportable in 75% to 90%, and 8 (14%) were reportable in less than 75%. Nineteen of
the infectious diseases were reportable in all of the states and territories that responded. Required reporting varies substantially by state or territory. Health care professionals are integral to public health efforts at the local, state, and national levels.

John T.J. et al in their study entitled, "Communicable diseases monitored by disease surveillance in Mottayam district, Kerala State, India" shows that the district level disease surveillance system centred in the government public health system has been highly successful. Disease surveillance was responsible for the government to obtain information on the prevalence of leptospirosis in the district. The reports enabled the public health officers to detect disease-clustering as the early signals of outbreaks and to take quick remedial measures. The major weakness in this otherwise successful surveillance system was the inability to conduct epidemiological or a etiological investigations on many of the reported diseases. There are no personnel trained in field epidemiology in the public health system. In addition, there was a lack of laboratory diagnostic support service, there are not the deficiencies of the disease surveillance per se, but those of the existing public health system infrastructure. Since the physician who prepared the list of reportable diseases has not encountered leptospirosis, and since the Director of Health Services denied information on its prevalence in the State, it was not included on the post card as a reportable disease.

Karimi A. et al (2000) also investigated, "The Active case-finding of communicable diseases in the south of the Islamic Republic of Iran". That summary of their study is given below:
The province of the Islamic Republic of Iran, established the Communicable Diseases Committee which determined 24 priority infectious diseases for active reporting. The committee chose laboratory criteria for diagnosis of the selected diseases, trained reporters and follow-up staff and invited cooperation from heads of private and government laboratories. Cases were identified by the reporting staff and patients were interviewed by the follow-up staff, who also requested patients to complete an epidemiological questionnaire. Results were returned to the district health care centers and to the Committee for data analysis. Case-findings in 16 out of the 24 selected diseases showed an increase of up to 30 times compared to passive case-finding. This was due more to the greater efficiency of the method than to cohort epidemics.

By establishing the active case-finding method, there was a significant increase in the frequency of communicable disease. New methods of case-finding have helped to improve the monitoring and surveillance of communicable diseases and to determine the health status. Except for malaria, the frequency of these diseases is the direct result of the new approach to active case-finding, and not due to epidemics.

Sharma M.K. et al conducted a study on "Surveillance of communicable diseases in tertiary health care system in Chandigarh, UT". Their study attempted to delineate the pattern of occurrence of communicable diseases so as to enable early identification, followed by appropriate and timely response to outbreaks. The method followed was to collect reports of listed communicable diseases from various departments and centers of Government Medical College, Chandigarh, who were involved in clinical care and laboratory diagnosis, were collected by the
Department of Community Medicine on a weekly basis. Analysis of surveillance data was done for a period of 1 year—including reports from March 2005 to February 2006. The results of study also show that the maximum workload of common communicable diseases was borne by health centers. The most common morbidity was ARIs, followed by ADDs and pulmonary tuberculosis. No significant gender predilection was seen. Overall reporting of communicable diseases observed in three different seasons was found to show a gradual increase from winter to summer through monsoon. Some specific seasonal trends were also demonstrated by various morbidities.

“A Comparison of Completeness and Timeliness of Automated Electronic Reporting and Spontaneous Reporting of Notifiable Condition” this study was conducted by Marc Overhage et al (2001). The aims of this study was to examine whether automated electronic laboratory reporting of notifiable-diseases results in information being delivered to public health departments more completely and quickly than is the case with spontaneous, paper-based reporting. They used data from a local public health department, hospital infection control departments, and a community-wide health information exchange to identify all potential cases of notifiable conditions that occurred in Marion County, during the first quarter of 2001. We compared traditional spontaneous reporting to the health department with automated electronic laboratory reporting the health information exchange. They found that after reports obtained using the 2 methods had been matched, there were 4785 unique reports for 53 different conditions during the study period. Chlamydia was the most common condition, followed by hepatitis C, and gonorrhea. Automated electronic laboratory reporting identified 4.4 times as
many cases as traditional spontaneous, paper-based methods and identified those cases 7.9 days earlier than spontaneous reporting\textsuperscript{73}.

"Retrospective Validation of a Surveillance System for Unexplained Illness and Death: New Haven County, Connecticut" was a research conducted by Michael in New Haven (2001). The objectives of this study investigated retrospective validation of a prospective surveillance system for unexplained illness and death due to possibly infectious causes.

A computerized search of hospital discharge data identified patients with potential unexplained illness and death due to possibly infectious causes. Medical records for such patients were reviewed for satisfaction of study criteria. Cases identified retrospectively were combined with prospectively identified cases to form a reference population against which sensitivity could be measured.

The result of study also show that the Retrospective validation was 41% sensitive, whereas prospective surveillance was 73% sensitive. The annual incidence of unexplained illness and death due to possibly infectious causes during 1995 and 1996 in the study county was conservatively estimated to range from 2.7 to 6.2 per 100,000 residents aged 1 to 49 years.

Active prospective surveillance for unexplained illness and death due to possibly infectious causes is more sensitive than retrospective surveillance conducted through a published list of indicator codes. However, retrospective surveillance can be a feasible and much less labor-intensive alternative to active prospective surveillance when the latter is not possible or desired\textsuperscript{74}.
A study by Fen Tan H. et al (2007) entitled, "Evaluation of the National Notifiable Disease Surveillance System in Taiwan: An example of varicella reporting" reveals that despite the mandatory reporting by laws, the incompleteness of notifiable infectious disease reporting is well documented in many countries for various diseases. The purpose of this study is to investigate the completeness of varicella reporting in Taiwan. Annual reports of National Notifiable Disease Surveillance System in Taiwan were compared to the annual outpatient claims of National Health Insurance (NHI) in the years of 2000, 2001, and 2002. Age and area-specific reporting rates of varicella were calculated by dividing the respective reported cases by the number of incidence cases. The reporting rate was the highest in aged 0 year in all years, followed by the 20-29- and 30-39-year groups. The reporting rate in each age group increased gradually during the study period. Other than Taipei City, the reporting rates in all regions were below 9% during this period. This study suggested that varicella reporting rate is very low in Taiwan. In addition, the reporting rates were inconsistent in 2000-2002, making the estimation of prevalence and vaccine efficacy using data from the National Notifiable Disease Surveillance System almost impossible. This study indicated that the physicians in Taiwan should improve their knowledge and attitude toward notifiable infectious diseases.

"Completeness of Notifiable Infectious Disease Reporting in the United States: An Analytical Literature Review" is a study carried out by Timothy J. et al in the year (1999). Their research show that despite state and local laws requiring medical providers to report notifiable infectious diseases to public health authorities, reporting is believed to be
incomplete. Through means of an analytical literature review, the authors synthesize current knowledge on the completeness of disease reporting and identify factors associated with reporting completeness. The review was limited to published studies, conducted in the United States between 1970 and 1999, that quantitatively assessed infectious disease reporting completeness. Thirty-three studies met the inclusion criteria. Reporting completeness, expressed between 0% and 100%, was treated as the dependent outcome variable in statistical analysis; disease, study location, time period, study design, and study size were treated as independent variables. Fifty-six distinct measures of reporting completeness were identified for 21 diseases. Reporting completeness varied from 9% to 99% and was most strongly associated with the disease being reported. The mean reporting completeness for acquired immunodeficiency syndrome, sexually transmitted diseases, and tuberculosis as a group was significantly higher (79%) than for all other diseases combined (49%) (P < 0.01).\(^7\)

Theobald S et al in their research called "Gender, equity: new approaches for effective management of communicable diseases." examined what is meant by sex, gender and equity and argues that these are critical concepts to address in the effective management of communicable disease. Drawing on examples from the three major diseases of poverty (HIV, tuberculosis and malaria), the article explores how, for women and men, gender and poverty can lead to differences in vulnerability to illness; access to quality preventive and curative measures; and experience of the impact of ill health. This exploration sets the context for the three companion papers which outline how gender and poverty shape responses to the three key

Weber, I.B. et al (2007) conducted a study entitled, "Evaluation of the notifiable disease surveillance system in province, south Africa" the objective of this study was to describe the qualitative aspects of the notifiable diseases surveillance system of the Gauteng province in South Africa; to conduct a cross-sectional survey on knowledge and practices pertaining to disease notification among private sector primary health care providers in Gauteng Province; to measure the underreporting of notifiable diseases versus positive laboratory diagnoses using malaria as a case and to identify the correctible short-comings in the Gauteng Health Department’s diseases surveillance system and to recommend ways of addressing these to improve the system and its performance. Their research shows that the notifiable disease surveillance system in Gauteng is deemed useful by the public sector communicable disease coordinators but less so by the private sector general practitioners. Data quality as indicated completeness of residential detail reporting on meningococcal notifications varied between 29% and district. Thirty seven percent of general practitioners report compliance with notifications and the mean score for knowledge on notification status of medical conditions was 56%. The sensitivity of notification on malaria compared with laboratory notifications was 26% with relatively higher notification rates whether occurred in children under 15 years of age.

Paol et al (1999) investigated the "Statewide System of Electronic Notifiable Disease Reporting From Clinical Laboratories" the objective of this study was to compare the
timeliness and completeness of prototypal electronic reporting system with that of conventional laboratory reporting.

The research found that a total of 357 unique reports of illness were identified; 201 (56%) were received solely through the automated electronic system, 32 (9%) through the conventional system only, and 124 (35%) through both. Thus, electronic reporting resulted in a 2.3-fold (95% confidence interval [CI], 2.0-2.6) increase in reports. Electronic reports arrived an average of 3.8 (95% CI, 2.6-5.0) days earlier than conventional reports. Of 21 data fields common to paper and electronic formats. Electronic reports are significantly more likely to be complete for 12 and for 1 field with the conventional system. The estimated completeness of coverage for electronic reporting was 80% (95% CI, 77%-82%) compared with 38% (95% CI, 37%) for the conventional system.

In this evaluation, electronic reporting more than doubled the total number of laboratory-based reports received. On average, the electronic reports were more timely and more complete, suggesting that electronic reporting may ultimately facilitate more rapid and comprehensive institution of disease control measures.79

Philip, O. et al carried a in (2006) on “Syndromic Surveillance for Emerging Infections in Office Practice Using Billing Data” the objective of this study was to evaluate the feasibility of conducting syndromic surveillance in a primary care office using billing data. The findings show that this preliminary study showed the feasibility of implementing syndromic surveillance in an office setting at a low cost and with minimal staff effort. Although many implementation issues remain, further
development of syndromic surveillance systems should include primary care offices.80

"Detection of epidemics in their early stage through infectious disease surveillance" was a study conducted by Shuji H. et al in (2000) which real that surveillance of infectious diseases is done in many countries. The aim of such surveillance include the detection of epidemics. In the present study, the possibility of detecting an epidemic in its early stage using a simple method was evaluated for 16 infectious diseases.

They found that when the specificity of the epidemic warring was more than 95%, the sensitivity was more than 60% in ten diseases, and more than 80% in four diseases (influenza-like illness, rubella, hand-foot-and-mouth disease, and herpangina. The positive predictive value was between 15.6% and 31.4% in these ten diseases. The early stage of epidemics of some infectious diseases might be detectable using this simple method.81

Dena, M. et al in 2004, conducted a study entitled "Systematic Review: Surveillance System for Early Detection of Bioterrorism-Related Diseases" shows that few surveillance system have been specifically designed for collecting and analyzing data for the early detection of bioterrorist event. Because current evaluations of surveillance systems for detecting bioterrorism and emerging infections are insufficient to characterize the timeliness or sensitivity ad specificity, clinical and public health decision making based on these system may be compromised.82

Donna F. et at (1993) investigated the "Evaluation a Method for Detecting Aberrations in Public Health Surveillance Data" the summary of their study is given below
reveals that a new analytic method and a horizontal bar graph were introduced in July 1989 to facilitate easy identification of unusual numbers of reported cases. Evaluation to the statistical properties of this method indicates that the results are fairly robust to non-normality and serial correlation of the data. An epidemiologic evaluation of the method after the first 6 months showed that it is useful for detection of specific types of aberrations in public health surveillance.

Nicholas F and Jones (2001) also investigated the Evaluation of an "Electronic General-Practitioner-Based Syndromic Surveillance System (GPSURV) in Auckland, New Zealand, 2000—2001" the objective of this study was to evaluate data capture, the method used to distinguish initial from follow-up visits, the definition of denominators, and the external validity of measured influenza-like illness trends. They GPSURV monitored three acute infectious-disease syndromes: gastroenteritis, influenza-like illness, and skin and subcutaneous tissue infection. Standardized terms were used to describe the syndromes. Data were uploaded daily from clinics and transferred to a database via a secure network after one-way encryption of patient identifiers. Records were matched to allow the distinction of follow-ups from first visits, based on between-visit intervals of <8 weeks. Denominator populations were based on counts of unique patients treated at participating clinics during the previous two years. Record completion was examined by using before-and-after surveys of self-assessed standardized-term recording. Between-visit intervals were also counted for matching records and alternative denominators were calculated on the basis of different observation periods. Weekly influenza-like
illness rates were compared with rates generated by an alternative system.

Their research shows that Physicians' self-reported recording compliance was highest for skin and subcutaneous tissue infection (71%) and lowest for influenza-like illness (48%). Initial visits had 18%--19% greater compliance than follow-up visits. The number of physicians reporting increasing compliance during the pilot was greater than the number reporting decreases for all conditions. Comparison of data with an independent influenza-like illness surveillance system indicated a close agreement between the two data series.

These results indicate that incidence of acute syndromes can be monitored, at least as successfully as a manual system, by using standardized clinical-term data from selected general-practice clinics. The provision of feedback reports appears to have a limited but positive effect on data quality.

"A Review of Salmonella Surveillance in New South Wales, 1998-2000" was undertaken by Merritt T and Unicomb L (2000). The objective of this study was to find the attributes of surveillance systems and simplicity, data completeness and timeliness of notification were evaluated. The findings show that the current notification system is a passive surveillance system. Notifications are made directly to public health units (PHUs), which are responsible for both the initial collection of data and for instigating an appropriate response. Laboratories notify their local PHU about cases. If the case is resident outside the PHU's area health service the notification is passed to the relevant PHU. Information is usually mailed to the PHU by the laboratory, as at present there is no capacity for electronic transfer of this
information. At the PHU, the standard set of data required by NDD is manually entered. These include: demographic information for the person, pathogen details, date for onset of illness, date of notification by the laboratory, and date of notification receipt at the PHU. For cases that are part of an outbreak, there is limited capacity to link them on the database and no opportunity to record information on suspected food vehicles, contributing factors, or other summary data.

Data in NDD is transferred electronically from the PHUs to the NSW Department of Health on a daily basis, and from there data that has been de-identified is sent electronically to the Communicable Diseases Network Australia to contribute to the NNDSS. Selected data from this system is then sent to the World Health Organization.

The overall notification system is complex with multiple data sources and decentralised and duplicated data entry. There was little missing or invalid data for most items. Completeness of serovar and phase type results was also assessed.

The notification system for Salmonella in NSW is complex. The system is not a useful repository for outbreak information and consequently dedicated databases for outbreak data have been developed. Databases that record serovar and phage type details are separately maintained at the state and national levels and these are not integrated with the NDD.

The completeness of the data for the mandatory data fields in NDD was good with the exception of the field describing Aboriginality. There was also incomplete recording of serovar and phage type results.
The problems identified with data completeness and timeliness identified by this study would be further improved by introducing electronic transmission of data from laboratories directly to NDD. This would reduce the current duplication of data entry and speed data delivery. Alternatively, a single database shared by laboratories and PHUs with appropriate security and access rules could reduce transmission delays and data errors.

"Web-based infectious disease reporting using Extensible Markup Language (XML) forms" the objective of this study was to explore solutions for infectious disease information sharing among hospital. Public health information systems is imperative to the improvement of disease surveillance and emergent response. The study aimed at developing a method to directly transmit real-time data of notifiable infectious diseases from hospital information systems to public health information systems on the Internet by using a standard XML format.

The findings show that there are 18,703 county or city hospitals in China. All of them have access to basic information infrastructures including computers, e-mail and the Internet. Nearly 10,000 hospitals possess hospital information systems used for electronically recording, retrieving and manipulating patients' information. These systems collect 23 data items required in the minimum data set for national notifiable infectious disease reporting. In order to transmit these data items to the disease surveillance system and local health information systems instantly and without duplication of data input, an XML schema and a set of standard data elements were developed to define the content, structure and semantics of the
data set. These standards make it possible to view and analyze the data accurately outside the hospital information systems in many different document formats. The paper also identified other issues involved in notifiable disease reporting in the future, such as the adoption of approved vocabulary standards and implementation problems such as the route, secure transfer, parsing, and objective identifying of the XML message.

XML is an increasingly important standard for exchange and transmission of data between disparate applications and systems. As in its early stages of developing an interoperable health information system in China, the XML document structures could be a way to exchange the notifiable case information among interest parties on the web at present. 
SURVEILLANCE MECHANISM IN BANGLADESH

**Institute of Epidemiology, Disease Control & Research**

**Health information unit of MOH**

- **Specialized hospital**
- **Medical College Hospital**
- **Union sub centers**
- **District Hospital**
- **Thanha health complexe**
- **General Hospitals**

**Monthly morbidity profile From all static health units**

**Weekly community-based information on certain identified diseases are collected by health assistants in all the Thana areas**

**Strengths**
- A National Institutes of Epidemiology and Research is providing leadership to the disease surveillance programme.
- Countrywide network of surveillance infrastructure is available.
- Legal back-up tools for notifying the disease is available.

**Weaknesses**
- Health units under the control of Director General Family planning, do not submit the information DGHS.
- Compilation, collation, tabulation, interpretation of EIS data require substantial strengthening.
- ICD has not been implemented properly.
- There is no legal instrument to enforce the private sector to submit information.
- Though medical college and specialized hospitals are required to submit information, in actual practice they are major defaulters.
- Laboratory support is grossly inadequate.
SURVEILLANCE MECHANISM IN BHUTAN

Epidemiology and research unit in the health division

- Monthly mortality and morbidity reports
- Notifiable diseases report
- Sentinel surveillance of selected Communicable diseases
- Lay reporting supplements health centre based information

Strengths
- List of notifiable disease available.
- HMIS task force is available.
- Computerized information unit at the national and district levels available.
- Sentinel surveillance for disease like HIV/AIDS has been established.
- Lay reporting supplements health facility based information.

Weaknesses
- Lack of adequate documentation.
- Weak feedback.
- Lack of adequate qualified personnel.
- Inadequate use of information at the point of collection.
SURVEILLANCE MECHANISM IN DPR KOREA

Strengths
- Large infrastructure with strong administrative back up support available.
- Epidemic response mechanism is prompt.
- Data management available at central level

Weaknesses
- Laboratory support services require strengthening.
- Epidemiology capacity in understanding the burden of disease requires strengthening.
SURVEILLANCE MECHANISM IN INDIA

**Strengths**
- System in place, being updated and modernized.
- Identified national focal point.
- Trends of diseases available.
- Reliable population statistics, vital statistics, health manpower statistics, socio-economic indicators etc are available.

**Weaknesses**
- Inadequate data.
- Delayed reporting.
- Mainly institutional data; no data collection from field activates.
- Poor quality data.
- Lack of validation mechanism.
Chapter 2

SURVEILLANCE MECHANISM IN INDONESIA

Minister

SEC-GEN

Director EPIM & KESMA

Routine surveillance system (Integrated SE)

Division of planning and information

SEC-DG

Special surveillance for epidemic

Center for data and information

Province

Province

District

District

Health centers and hospitals

Health centers and hospitals

28 CDs (HC&Hosp)
4 NCDs (hosp) sentinel centers (HC)
monthly report of outbreak.

Special surveillance package

In the event of significant increase in incidence of a disease meeting criteria established for an outbreak information must reach within 24 hours from health centre and the information must be verified and investigated and detailed reported on by the district.

Strengths
- Notifiable disease lists is available.
- Island-wide coverage through WAN.
- Special surveillance system provides good quality data.

Weaknesses
- Lack of case definition.
- Routine reports are neither complete nor timely.
- No proper analysis of reported data takes place at the district level.
- Poor motivation to report; importance of notification not realized by health staff.
- Inadequate supervision and poor technical supports.
SURVEILLANCE MECHANISM IN MALDIVES

Health information unit

- An early waning signal system is in place covering the entire country.
- Daily information is collected and analyzed for all diseases.
- The reports are received from all the health centres and hospitals in the island and the information flows from the institutions to atoll Region and then to the country level.

Strengths
- Large number of islands spread over a wide area well connected through an improved communication system.
- Clear organization for disease surveillance.
- Simple standard operating procedures have been established.
- Good community involvement in disease prevention and surveillance.
- Good feedback system is available.
- Computerization at decentralized units.

Weaknesses
- No surveillance policy.
- Weak supervision and support.
- Weak central coordination.
- No quality control.
- Data analysis is done at central level only.
- No regular surveillance monitoring meetings.
- Limited laboratory support.
SURVEILLANCE MECHANISM IN MAYANMAR

Strengths
- Outbreak identification is usually made with laboratory support.
- Technical assistance as well as supplies and sometimes financial support are usually provided to the Township Medical Officer.
- Multisectoral collaboration and coordination are available during disease outbreak.
- Suspected cases are reported by lay person and confirmed by Township Medical Officer.

Weaknesses
- Inadequate training of basic health staff in epidemiology and disease reporting.
- Electronic communication media, supplies and transport facilities are limited in disease control activities.
- Delay in reporting due to difficult terrain in some parts of the country.
- Poor supervision and monitoring.
SURVEILLANCE MECHANISM IN NEPAL

- **NPC**
- **MOH**
- Epidemiology & disease control division/DHS
  - **HMIS**
  - Routine surveillance
  - **District health office**
  - **Monthly report on selected communicable disease in HIMS format**
  - **Hospital**
  - **District health office**
  - **EWARS**
  - **Sentinel Sites**
  - Direct outbreak reporting from the periphery as and when occurs

**Strengths**
- Focal point for surveillance is identified.
- Commitment for surveillance of priority diseases.
- Routine system is in place.
- Supportive reporting system strengthen the surveillance system.
- Available of case definitions and standards.
- Annual performance reviews are conducted.
- AMR monitoring system and protocol been setup.

**Weaknesses**
- Inadequate technical capacity at the central level for data management, analysis, interpretation and decision making.
- Inadequate commitment at the local level.
- Low sensitivity in relation to outbreaks.
- Weak implementation plans.
- Feedback is not available for community-level health workers and volunteers.
- Insufficient number and capability of surveillance workers.
- Inadequate monitoring and supervision.

**MIS formats are used by all health facilities.**
**MIS ensures reports form all districts and in operation from 93/94.**
**The information received from the periphery is collected at the district health office and sent to MIS/P&FAD, DHS.**
**At the central level, the district reports are collated by MIS/P&FAD/HDS and**
SURVEILLANCE MECHANISM IN SRI LANKA

**Central epidemiological unit**

- Special campaigns to generate focused information
- Medical research institute
- Specialized hospital
- Special disease control programmes
- Hospital

**Regional epidemiologist**

- Medical Officer of Health

**Notification registers** are required to be kept in hospital and in the office of MoH
- MoH is required to send report on communicable disease every week
- For group A disease (cholera, plague and yellow fever) and acute flaccid paralysis notifications are required to be send by the hospitals to Central Epidemiologist unit.
- Zero reporting is also required
- Active surveillance in large provicial hospitals and by Asst. Epidemiologists in the Children’s hospital

**Medical practitioners** are required to make provisional diagnosis for the diseases covered under notifiable list and report

**Report is to be investigated by public health inspector and verified**

**Strengths**
- There is a central unit recognized by the medical community.
- Long-standing and well-established surveillance system is available.
- List of notifiable disease is available with legal backing.
- Dedicated public health staff is responsible and weekly reporting is done inclusive of zero reporting.
- Support from international organizations in surveillance activities.
- Regional emergency action committees and rapid response teams are available.
- Weekly feedbacks are available for all the parties concerned and international organizations.

**Weaknesses**
- Under-reporting by the private sector due to poor understanding of the utility of the system and poor support from private practitioners.
- Late reporting due to late notification should be made with provisional diagnosis.
- Late investigations due to lack of public health staff.
- Laboratory support is inadequate.
- Outpatient recording of morbidity in government hospitals is not satisfactory.
- Data analysis in the Region is done manually.
- Regional laboratory surveillance and support is poor.
- Poor supervision and sustainability of trained human resource.
SURVEILLANCE MECHANISM IN THAILAND

Minister of Health

Permanent secretary of Min. of public health

Division of epidemiology

Region

Provinces

Provincial hospitals

Regional hospitals

Specialized hospitals

Health centre

Private hospitals

Govt. hospital

- A nationally standardized reporting network with standard case definition based on clinical and laboratory diagnosis is in place for the last 20 years.
- Information on more than 60 notifiable disease are collected weekly, analyzed and feedback provided to all concerned.
- It also helps to detect outbreaks, predict epidemics and estimating disease impact.
- Physicians who diagnose any of the notifiable disease are required to submit a report by using a case notification form.
- A notification change form is also available for submission for the revised diagnosis following receipt of laboratory results.

Strengths

- Clear goal with support from policymakers.
- Well-established system with one central unit for entire disease surveillance.
- Computerized recording at provincial level.
- Laboratory support is good.
- Good epidemiology training centres.
- Functional feedback system.
- Utilization of information for action.
- A number of well-trained epidemiologists are available.

Weaknesses

- Some delays in reporting.
- Under-Utilization of data at the periphery.
- Lack of incentives for doctors to work as epidemiologists.
- Inadequate number of medical epidemiologists in some provinces.

Source: www.who.int
Public Health Services in India: A Historical Perspective

"Each pattern of approach to health care emerges as a logical outcome of a given political, social and economic system. These forces generate an unwritten policy frame which influence the health of a population”.

Throughout known history, human beings have made efforts to explain illnesses and devised methods to deal with them, individually and collectively. Indian society has been no different. So when health service development was undertaken as a focus of planned actively by the state in Independent India, it was to add substantially to the existing systems of health care. The latter had not been able to grow over the years to meet the new challenges posed by the dynamic health situation. The knowledge systems of health care had gone into a decline and were incapable of adapting to the changing social and physical environment as well as the political and cultural context. The health status and morbidity profile and any major determinants in the profile and any major deterrents in the population have to guide the structure and functioning of any public health system. These will to some extent also reflect the impact of the latter. All these dimensions require that health service development relate to the specific social and epidemiological context, with a necessary responsiveness to change as these parameters change over time. The question that causes concern is whether the public health service system developed in post-Independence India was able to do so? What are the challenges and the way forward today?

In order to answer these questions this paper examines the evolution of health services in post-Independence India up to the
present time, against public health principles and the debates on structure and content of health care system. The argument is that the experience has been mixed, and that both the gains and the negative consequences are the logical outcome of choices made when adopting models of planned development at the time of Independence. The paper ends with some lessons drawn from past experience for evolving a pro-poor, pro-people health care system in the present context.

The population in India is 1000 million and the number of villages are 0.58 million. The life expectancy at birth 62.4, Birth rate is 27.2. Death rate is 8.9, IMR is 71.0 MMR is 4.37, Couple protection rate is 45.4 (SERVICE DATA-97) TFR 3.5 (SRS 95) State and Union territories 25, 7.

Total public health budgets is 5000 million. Primary health centers have 22991 Hospital beds in government and 0.704 million in private. There exists multiplicity of agencies are dual reporting systems making Indian heath care system very complex. The complexity of the Indian health care system is illustrated in the following diagram.

Source: Evaluation of Health Management Information System in India
Need for Computerized Databases in HMIS

65
Procedure of collecting data of national notifiable infectious disease in India:

The data in the field by the health workers of the public sector units at CHCs, District Hospital, sentinel private practitioners, hospitals, urban hospitals, ESI, railways, medical college hospitals, sentinel private nursing homes, medical college, private and NGO laboratories are collected and recorded. These needs to be complied and transmitted to the next level on a regular basis. The day of the week for reports to reach district surveillance office. This should be done on fixed date from each type of reporting unit, and in same cases use telephone, fax, e-mail, special messenger, police wireless any method to report immediately. The collected data in the Moof PHC will report weekly statistics on Monday to CHC and from there, to the state health center who sent to CSU.

All the national health programmes require that the cases and death recorded in the out-patient or in-patient departments of hospitals, dispensaries, CHC, PHC and other health facilities is manned by on a monthly basis. In the Integrated Disease Surveillance Programme (IDSP) the essential surveillance components will be identified and transferred to programme officer facilities so that information for action is available on weekly basis. At each level in the system, the report is required to be analyzed and appropriate action taken as indicated. The reports should be checked for completeness and regularity as these factors can influence the analysis of the reports.
Sources produce data of Notifiable infectious diseases in India:

Sources produce data of Notifiable infectious diseases including: District hospital, PHC, Rural Medical Colleges, District (TB, HIV, Malaria), Police Medical Colleges, Urban and Rural selected Sentinel private sites, private hospital, laboratories, practitioners, clinic, water department.

Kind of data notifiable infectious diseases in India:

The data of demographic, clinical, epidemiologic study and the date of test performance are the data which are observed on the special forms of notifiable disease.

Methods of data collection of Notifiable diseases in India:

Several methods can be used for collecting data. While routine reporting (passive surveillance) is universalized, other methods are need and area specific. These include:

I. Sentinel Surveillance
II. Active Surveillance
III. Vector Surveillance
IV. Laboratory Surveillance
V. Sample Surveillance
VI. Out break Investigations
VII. Special Studies

Mechanism of reporting data of Notifiable diseases in India:

The cases that have been detected and recorded need to be compiled and transmitted to the next level on a regular basis. The mode of transmission will be in any of the following methods.
Letter, Fax, Telephone, Direct Courier, E-mail, Special Messenger, Police wireless and hard copy of form ‘A’ and from ‘L’ will also be sent by PHC Medical Colleges, District Hospitals, Railway Hospital to CHC and some to District surveillance officer.

**Time periods of sending data of Notifiable diseases in India:**

Taking into consideration, the types of diseases different time periods are found for sending report:

- **Immediately Report:** Some outbreak may be explosive and become apparent in a short time. This should be investigated immediately. Use Fax, Telephone, Direct Courier, E-mail, Special Messenger, Police wireless and any methods of reporting immediately.

- **Daily Report:** Daily reports are necessary once and outbreak has been identified so that the situation can be monitored.

- **Weekly Report**

- **Monthly Report**

Internal written records on counters special from and its sending.

**Criteria of acceptance of Notifiable diseases in India:**

Criteria of acceptance of notifiable diseases including suspect case, probable case and confirmed case.

In the manual of every notifiable disease, definition and case classification of diseases are mention.

**Data analysis methods Notifiable disease in India:**

- Tables
- Graphs
• Maps

• Some of the measures that need to be used for analysis are:
  - Cases
  - Deaths
  - Incidence Rate
  - Incidence rate of Disease
  - Case Fatality Ratio
  - Case Fatality ratio for Disease

**Methods of dissemination and propagation of Notifiable disease in India:**

It is essential that feedback loops be in-built in the system. A use of dissemination allows the staff at various levels to understand what is happening in their level and also at other levels. It also gives them idea of their performance in comparison to other colleagues. It helps the staff at the lower level identify their strengths and weaknesses. Options for disseminating data and or information from the system include electronic data; the Internet; press releases; new letters; bulletins; poster; monthly review meetings; reports; information sheet; presentations and handouts.

**Instructions, policies of safety and confidentiality of data:**

The exact number of diseases which need obligatory reporting should be available and their published list should be accessible to the provider of healthcare. Meanwhile, considering the needs which have raised, the list should be edited periodically and in case of necessity, a disease is added or is left out. Diseases definitions and reporting method must be explicit. Clear
definitions of tasks and duties concerning the whole three management level: local, state and national level and reinforce coordination during them. To increase consistency of the reporting process, standard forms are necessary.

Surveillance system and back up of information system should be designed in a way that personal information should be accessible only to permitted individuals. There should be sound policy and transparent written regulations and instructions in this regard, and Manual and Electronic data file must be protected. Data should be classified so that no irresponsible individual can trace the patients.

In this context there is no any general and arranged instruction, but there is instruction about keeping secret on the report of the sexually transmitted diseases like syphilis. Also in the latest instruction, there is emphasis about keeping secrecy while reporting HIV/AIDS. There is recommendation about using of numerical code in communication about the history of patient, marital status, and the requester of the test. Attention to the principle of immunity in the filing and data bank and all of the processes are compulsory.

**Method for data control of notifiable infectious diseases in India:**

Data quality, their recorded credibility and completeness are indicated. Data quality refer to means of trusted data sources, appropriate statistical method, consensus on national reporting standard, measure for quality control, notifiable infectious disease definition, standard report based on it, Professional public health standard for reporting specified
period for reporting, consultation with user society is guaranteed and criteria for standard quantity in this country are as follows:

1. To control duplicate reported cases.
2. To control completeness of reported cases
3. Timely control of reported cases
4. To control accuracy of reported cases