USAID's Strategic Approach to Public Health Surveillance

The most important commodity for any public health care system is information. Without information, public health as we know it would not be possible. The Centers for Disease Control and Prevention defines public health surveillance as:

> "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." [1]

WHO notes that epidemiological surveillance is "the systematic collection and use of epidemiological information for the planning, implementation, and assessment of disease control."[2] Additionally, Vaugh and Morrow elaborate on the types of surveillance by noting that there are two different uses of the term "surveillance", it can be a:

> "continuous scrutiny of the factors that determine the occurrence and distribution of disease and other conditions of ill health …. Such a broad definition almost equates surveillance with routine health information systems and the two can therefore be considered together." In addition surveillance can be seen as a "special reporting system which is set up for a particularly important health problem or disease … Such a surveillance system is often organized for a limited period and is closely integrated with the management of a health intervention programme."[3]

All definitions have several things in common. They draw attention to the critical process of systematic collection of data, the analysis and interpretation of that data to generate information, and the need to link the information to use. Without these characteristics, a country does not have a health information system. Further complicating the understanding of what is needed to develop a health information system is the terminology that surrounds the subject. The terms "surveillance", "public health surveillance", "disease surveillance", "management information system", "health information system", and "epidemiological surveillance" are often used interchangeably and confuse our understanding of what comprises a health information system. To some extent these different purposes for collecting information can even become rivals to each other. USAID considers the highest level of information related to addressing issues of

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[1] Centers for Disease Control. January 1988. *CDC Surveillance Update*. Atlanta, GA: CDC.

[2] World Health Organization. "Report of the technical discussions at the twenty-first World Health Assembly on national and global surveillance of communicable diseases". Geneva: WHO, 18 May 1968: A21.

[3] Vaugh JP and Morrow RH. Manual of Epidemiology for district health management. Geneva; World Health Organization, 1989, pages 47-49.

public health importance is considered to be the "health information system". All other terms reference specific subsets of that system.

Health information is essential to the ability of a health system to function effectively, generating expected health outcomes within reasonable cost parameters and ensuring timely response to disease outbreaks or other unexpected threats to the health status of the population. Designers and implementers of health promotion and disease prevention activities require information if they are to be able to achieve their disease control targets; providers of routine services must have access to reliable management information in order to provide services that are appropriate, timely and cost-effective; health policy makers need to have access to reliable summary information in order to develop sound health policies and allocate resources in an effective manner; and the international health community must have timely information concerning disease outbreaks if they are to limit the spread of infectious diseases and organize effective response mechanisms to deal with local outbreaks.

Health information systems are integrated processes for collecting health-related data, transforming that data into information through analysis, and using the information to inform and direct action. The traditional components of a health information system are its policy or legal basis, reporting mechanisms, data collection methods and instruments, data analysis and interpretation, information dissemination and presentation, and information use. The intent of the health information system must be well thought out and related to the ability of the health system to act on the information. Additionally, the data collected must serve valid public health information needs as well as protect individual privacy rights.

The basis for data collection must be established by policy and law. Appropriate legal parameters and policies for the collection of data must be established to ensure the protection of the individual and engender compliance with the need to report designated health events. The primary mechanisms for data collection in many countries have been notifiable disease and related reporting systems, vital statistics, sentinel surveillance, registries, health surveys, and administrative data collection systems. Other methods have been developed and tailored to meet specific needs and conditions such as community surveillance for diseases like dracunculiasis and poliomyelitis. Data collection instruments should function with standardized definitions and reliable diagnostic procedures, only collect information that is needed, ensure the quality of the data, and guard against its misuse. Laboratory capacity is an important aspect of the collection process. Well functioning laboratories are needed to ensure proper diagnosis and provide more detailed information about the specific disease agent.

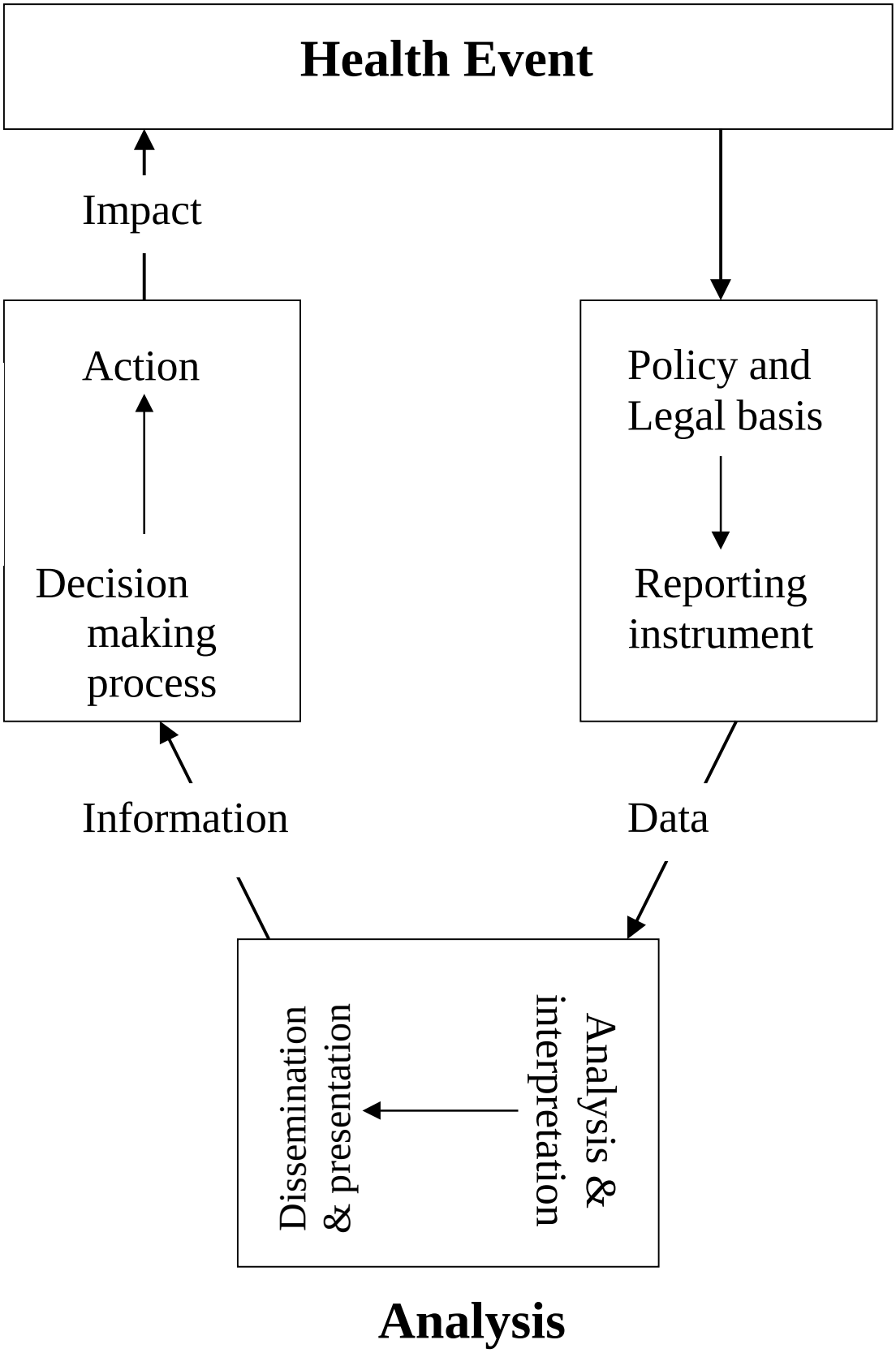
Analysis and interpretation of data is the process of producing information. Numerous methods of drawing meaning from data have been developed. For example, Geographic Information Systems (GIS) place health data in the context of the physical location of the event in order to establish associations between disease incidence and possible causal or risk factors. Numerous computer programs are available to analyze disease and management data and display it in a standardized manner that facilitates interpretation.

The analytic process may consist of a basic set of analyses performed on a routine basis or it may involve more detailed research into a specific health event. Interpretation of the information generated from analysis is the process by which decision-makers are presented with the implications of the analytic process. Interpretation also involves dissemination and presentation. A critical concern is to avoid the separation of the collection, analysis, and use functions and, thereby, inhibiting the relationship between information and action. Information can be disseminated through various methods (reports, internet, publications, maps, etc.) and made available to those who need to use it. This is often a critical weakness in many information systems as information does not easily move to the lower levels of the health care system where the information is essential to generating appropriate action. The process of presentation is how the information is provided to potential users. The methods of presentation can determine whether the information will be understood, will be accepted, and will be acted upon.

Finally, information must be used in the development of public health interventions. Its use could generate the expansion of health services, development of new interventions, redirecting old interventions, establishing new policies or changing existing policies, altering the allocation of health resources, mobilizing resources to address emerging threats, or better coordination of inputs to maximize the impact of health interventions. A viable health information system will link information with the appropriate user, ensure that the capabilities to understand the meaning of the information exist, ensure that the appropriate individuals know what course of action to take in response to the information, and ensure that the information users have the resources necessary to act on the information. The "use" capability goes to the heart of an effective health care system and must be a factor in the design and implementation of any health information system by combining the capacity to collect, analyze and use information at all appropriate levels of the system.

Figure 1 provides a view of the critical elements of a health information system. The process defined in this figure can apply to any health event, be it a sudden disease outbreak, the maintenance of a routine preventive service, or a review of the effectiveness of a specific case management approach. Regardless of the subject of the event, the elements in this model are applicable. While figure 1 appears to compartmentalize certain activities within the health information system, it is not meant to disassociate one element from another. A health information system is all three elements functioning properly and in coordination with each other. For example, a system that does not collect reliable or appropriate data will undermine the "use" component; a system that improperly interprets the data can generate inappropriate actions; and a system that does not act on the information will eventually undermine the collection and analysis of the data. As much as this allows us to understand how a system should function, this model also assists in analyzing the weaknesses in developing country information systems and designing appropriate interventions for addressing those deficiencies. Some of the more common failures of health information systems in developing countries are described below.

Figure 1


Health Event
Impact
Action
Decision making process
Policy and Legal basis
Reporting instrument
Information
Data
Analysis & interpretation
Dissemination & presentation
Analysis

The data collection process often lacks the necessary policy basis to legitimize data collection and ensure that all reporting elements are providing the required data in a standardized format. Data collection can also be hindered by either too much data or data of poor quality being collected. Data is often collected without adequate consideration for how and by whom it will be used and data collected in the absence of an intended use is a detriment to an efficient and effective health information system. Frequently, data collection is not standardized by case definitions or diagnostic categories thus inhibiting the comparability of data from one region to another. Data collection systems are often, untimely, inflexible, unrepresentative, too complex, and lack sensitivity to specific events. Laboratory data is often lacking or unreliable. Without verification of clinical diagnoses, disease specific data may be subject to errors, which can result in inappropriate actions being taken. These weaknesses undermine confidence in the overall health information system.

Analysis and interpretation of data is problematic in many developing country health information systems. Either the procedures for analyzing the data are not known and applied or non-health considerations inhibit the generation of objective information. Standardization and assurance of good quality data are essential to the process of analysis. Often those responsible for analysis are not those responsible for using the information and, therefore, the analytical process is hindered by a lack of association with information use. Analysis and interpretation can and should be conducted at all levels. Health officials in the periphery should understand how to analyze the data they collect in order to improve their ability to deliver proper services. This is especially true with health systems that are decentralized. If responsibility to manage health services is decentralized, then the capacity to analyze and interpret health data must exist at the decentralized level. Proper tools and techniques for the analysis and interpretation of data at all levels must be developed. New and refined approaches, such as GIS, are being developed, but they must be made more functional at all levels. Computerized systems of analysis are extremely valuable with their ability to conduct accurate and complex analyses and present information in a usable format; however, they may be inappropriate at peripheral levels due to the lack of electricity or inadequate support services. The appropriateness of any analytical tool must be given serious consideration before it is introduced into a particular setting.

Finally, many developing countries fail to use information to guide the decision-making process. Without better informed decision-makers, health resources are subject to waste and serious health issues can go undetected until they necessitate very costly and difficult solutions. The failure to incorporate information into the decision-making process undermines the utility of the health information system and erodes the benefits derived from the investments made in that system. Often, information is seen as a possession of the upper levels of the government structure, not to be shared with peripheral health officials, while in other cases the flow of information within the health structure is not designed to facilitate action or information is not shared in a timely fashion. For example, information on outbreaks that require immediate action may languish with health officials who do not recognize the need for immediate action because the

information was not disseminated or presented in a way that reflected its time sensitive nature. In other cases, health officials may simply not understand the meaning of some information and therefore, fail to react properly. Numerous failures occur with this aspect of the overall system and far too little attention has been given to address these weaknesses. When information is not acted upon, the need for proper collection, analysis, interpretation, dissemination and presentation is discounted such that the entire information system loses relevance and eventually deteriorates.

The overall impact of weak information systems in developing countries also has serious implications for the global struggle against infectious diseases. Weak national health information systems are a critical defect in the global effort to control the spread of infectious diseases and place at risk not only the health of the populations within that country, but also increase the health risks for the rest of the world. Global problems, such as antimicrobial resistance and the spread of once isolated diseases, can only be aggravated by inadequate national health information systems.

While the problems associated with health information in developing countries are easily recognized, the solutions have largely eluded the development community. Efforts to build national level health information systems have often failed to meet their targets. New approaches and concepts are needed if we are to produce a more evidence based climate for the design and management of public health interventions. The goal of the information component of this procurement will be to improve the capacity of selected countries to collect, analyze and use information that facilitates the effective response to infectious diseases as well as the efficient and effective management of public health services. The critical elements in this goal are **focusing effort at the country level**, **building capacity within countries, creating a "culture of information"**, and **linking information to use**.

Several other important factors need to be taken into account during the design and implementation of this activity. As has been noted, health information systems cover a wide range of activities. A strategic approach with a country will identify a specific subset of information to begin the process of building capacity as opposed to trying to address all areas of the information system at one time. That beginning point must be chosen carefully, as it needs to embody the principals and skills that are needed to strengthen other elements of the information system. An example of a starting point could be to build on the work being done with surveillance for acute flaccid paralysis (AFP) in conjunction with the polio eradication program. This offers an opportunity to take advantage of the significant effort being put towards building AFP surveillance and using it as a way to support other information needs. Another example could be to build on the management information systems that have been developed to support the Expanded Program on Immunization (EPI). These information systems introduce many of the basic skills needed for processing information and using it to make decisions related to a public health care intervention. Within the strategic process of developing a country approach the contractor will need to identify a starting point from which to build the capacity needed to eventually sustain the other health information needs of the country.

As equally challenging as determining the correct starting point to generate a “culture of information”, is the ability to recognize whether the inputs being provided are producing sustainable changes in the way in which health officials collect, analyze and use information. To accomplish that, it is necessary to define the qualities that one wants to see in a sustainable health information system. All health information systems must have the ability to conduct routine information functions. For example, management information systems for interventions such as immunization have a well established and standardized content and should be common to any information system. Routine systems for reporting common infectious diseases are also rather well established, even though country by country variations do exist. However, building these elements into a health system does not necessarily mean that we have built a successful health information system. As Marcel Proust noted, “the real voyage of discovery consists not in seeing new landscapes, but in having new eyes”. The task is to go beyond the mere structure of a health information system and to equip health officials with "new eyes". Health information systems are dynamic processes which need to adapt to the changing health needs of the population. New health problems which demand attention will arise and the capacity must be developed within the country to be able to respond to these demands. This means that the skills of data collection, analysis, interpretation, dissemination and presentation must be preceded by a “culture of information” that makes evidence-based decision-making the basis for public health decisions and, thereby, links information to action as an imperative pre-requisite.

Finally, an important element in the design of the USAID approach to health information systems is the level within the health system at which the inputs are targeted. Information is best placed in the hands of those who can use it. A critical flaw in most information systems is that information flow is usually upward to a centralized level while the greatest need for information that informs action is primarily local. Public health impact is usually best achieved by empowering local health authorities, communities and households to take control of conditions, which threaten their health status. Information is the currency of empowerment and needs to be in the hands of those best positioned to make the best use of it. This calls for a programmatic design to carefully consider not only what capacity it builds, but where within the health care system it focuses its attention. Furthermore, as health care systems decentralize, the need for greater skills in data collection, analysis and use are at the peripheral level. In all cases, the primary criteria, which should guide the targeting of inputs, should be the capacity for achieving public health impact. The most effective level to achieve this impact in most health care systems is at the service delivery level and the community.

The orchestration of assistance to countries trying to build better health information systems is a critical concern of USAID. Inputs must be timed and coordinated in such a manner that they support a logical progression of capacity building. Problem areas must be anticipated and operations research conducted that develop the best possible solutions. Our understanding of the dynamics of the health care systems must be equal to the task of developing a culture of information as well as a structure of information. The physical components of a health information system alone will not necessarily mean that

information has become a preeminent element in decision-making and action. There must also be an attitudinal change that gives preference to decisions and actions that are tested by the process of objective critical analysis. Only then will we have established the basis for a sustainable health information system that improves the quality of action with respect to health promotion, disease control and system management.