Epidemiological surveillance is the systematic collection, analysis, interpretation and timely dissemination of health data for the planning, implementation and evaluation of public health programmes. The application of these data to disease-prevention and health-promotion programmes completes a surveillance cycle in public health (1).

Health data have been collected on a routine basis for over a century (2). In 1847, for example, William Farr used routinely collected mortality data to describe the impact of epidemic influenza in England and Wales (3). It was not until the middle of this century, however, that Alexander Langmuir developed the concept of surveillance as the routine process of collection, analysis and dissemination of health data (1). Subsequently, the concept of epidemiological surveillance has expanded to include broader issues in public health and the application of new methodologies (4, 5). There is little written, however, in either textbooks of epidemiology and public health or in the medical literature that serves as a guide to programmes wanting to evaluate their surveillance activities.

Established surveillance systems should be periodically reviewed on the basis of their quality as well as their usefulness and cost. They may then be modified accordingly. In assessing the quality of a surveillance system, one should review the following seven attributes: (i) sensitivity, (ii) specificity, (iii) representativeness, (iv) timeliness, (v) simplicity, (vi) flexibility and (vii) acceptability. Specific measurable criteria should be developed based on these attributes and linked to utility and cost.

Most published evaluations of surveillance systems have been limited to infectious diseases (4, 6-9), although there have been some efforts to assess the appropriateness of various data sources for the surveillance of other kinds of health problems (10-12). The purpose of this paper is to build on these fragmentary descriptions and to propose an evaluation method that can be applied to all types of systems of epidemiological surveillance. This method will begin with an assessment of usefulness and cost, and will include review of the seven attributes listed above.

**Usefulness and cost**

**Usefulness**

A surveillance system is useful if it generates a public health response leading to the control and prevention of adverse health events or to a better understanding of the process leading to an adverse outcome. An additional consideration is the extent to which the knowledge obtained from surveillance data about the epidemiology of a health event leads to better understanding of a health problem (e.g. the identification of foreign travel as a risk factor in disease transmission) (13-16). Even a very crude system of surveillance may be useful to public health practitioners (e.g. counting the total number of deaths seen by a medical examiner during a heat wave (17)).

The simplest way to assess usefulness is to ask those involved in public health practice. Surveys of public health officials at the state and local level, for example, have indicated that routine notifiable disease reports for viral hepatitis and measles are useful for disease prevention and control (18, 19). A more rigorous approach to defining usefulness is through assessment of the impact of surveillance data on policies and interventions, and ultimately their impact on the occurrence of a health event. While policy analyses have been conducted elsewhere in the health field (20), there are no such studies of surveillance systems. Such policy analysis requires both observation and understanding of the decision-making process and quantification of the impact of surveillance information on the measures of interest (i.e. morbidity, mortality, disability and quality of life). The latter can be accomplished by a quantifiable score such as the Disease Impact Score, which expresses as a single index the estimated impact of prevention on morbidity, mortality and cost, and attributes a portion of that score to surveillance (21). Although surveillance data may be important to health decision making and policy formation, decisions affecting surveillance are often based on changes in more general programme directions rather than detailed analysis of a particular system (e.g. directing resources away from routine contact tracing for gonorrhoea control to programmes for the prevention and control of acquired immunodeficiency syndrome).

We recommend that the evaluation of the usefulness of a surveillance system be based on answers to the following questions. Does the system:

- detect trends signaling new problems and lead to control and prevention activities?
- detect epidemics leading to control and prevention activities?
- provide quantitative estimates of the magnitude of morbidity and mortality related to the health event under surveillance?
- identify factors involved in disease occurrence?
- facilitate research likely to lead to control or prevention?
- permit assessment of the effects of control measures?

The usefulness of a surveillance system should be reviewed periodically as illness patterns change and new priorities emerge. If a system is not directed towards high-priority health events and used as a tool to drive

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**A METHOD FOR EVALUATING SYSTEMS OF EPIDEMIOLOGICAL SURVEILLANCE**

Stephen B. Thacker, R. Gibson Parrish, Frederick L. Trowbridge & Surveillance Coordination Group

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The usefulness of a surveillance system should be reviewed periodically as illness patterns change and new priorities emerge. If a system is not directed towards high-priority health events and used as a tool to drive
public health activities, either efforts must be made to improve the surveillance system or these resources should be directed elsewhere. For example, public health programmes to prevent unintentional injuries have received increasing emphasis in recent years. Data on injuries are available from emergency-room records (22), medical-examiner information (23), vital statistics (24) and police-arrest records (25). The usefulness of a surveillance system based on these data should be assessed in terms of the specific goals of injury-prevention programmes. If the injury-control efforts in a community focus on a particular problem such as adolescent drinking and driving, the surveillance system must be able to measure the specific impact on the target population (26). In this example police records, as well as population- and age-specific morbidity and mortality data, must be identified and linked to programme activities.

Cost
Surveillance can be costly, particularly in the development of new systems or the enhancement of current ones. One can assess current systems in terms of costs and benefits and can apply the lessons from these efforts to further surveillance activities. The economic analysis of surveillance systems has received little methodological attention apart from the accounting of direct costs to health agencies. To assess direct and indirect costs, all elements of a surveillance system, including data collection, analysis and dissemination, must be identified and costs assigned to them. To calculate a benefit/cost ratio, the benefits such as illness prevented can be estimated, including the reduction of medical-care costs and of time lost from school or work. A 1983 Vermont report of active surveillance (initiated by the health department) of four infectious diseases estimated that costs were too high to justify active surveillance in that setting unless unquantified subjective benefits involving value judgements were great, such as improved relations with physicians (8). A 1985 report from Kentucky, on the other hand, found a positive benefit/cost ratio associated with health-department-initiated surveillance of hepatitis A (27). Beyond these state-based efforts, however, there is much to be accomplished in the assessment of the benefits and costs of epidemiological surveillance.

Evaluation of the quality of surveillance systems
The seven attributes we have identified to measure the quality of surveillance systems can be subdivided into qualitative and quantitative attributes. The quantitative attributes—sensitivity, specificity, timeliness and representativeness—can be readily defined by numerical measures. Simplicity, flexibility and acceptability, on the other hand, are more subjective measures and are thus less easily quantified.

Sensitivity
Sensitivity is defined as the ability of a surveillance system to detect true health events. Health events may be defined as (a) instances in which persons have a particular health problem or risk factor; (b) a more narrowly defined subset of (a) (e.g. fatal events); or, more broadly, as (c) an epidemic of a particular health event. Quantitatively, sensitivity is the ratio of the total number of health events detected by the system over the total number of true health events as determined by an independent and more complete means of ascertainment (Fig. 1). In published reports, sensitivity has been termed completeness of reporting and has been studied more than the other six attributes (6, 7, 13, 14, 28).

A variety of activities and circumstances will have an impact on sensitivity. For example, an uncommon, highly virulent disease for which there is an intervention (e.g. smallpox) is more likely to be reported than a common condition which is rarely fatal (e.g. gonorrhoea or varicella). A surveillance system monitoring a large number of events can be very useful even with a low sensitivity if the reports are representative (see below). Alternatively, health-department-initiated (active) disease-reporting systems are also likely to increase reporting over provider-initiated (passive) systems (8, 10, 29). The level of sensitivity can also vary to address specific programme goals. When control activities are contingent upon the identification and reporting of every case (e.g. the late stages of the international smallpox eradication campaign (30) and the United States Measles Elimination Program (29)) sensitivity is the critical criterion for assessing a surveillance system.

FIG. 1
MEASURES OF SURVEILLANCE SYSTEM PRECISION
DÉTERMINATION DE LA PRÉCISION DU SYSTÈME DE SURVEILLANCE

<table>
<thead>
<tr>
<th>Health event present</th>
<th>Evénement sanitaire existant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes - Oui</td>
<td>No - Non</td>
</tr>
<tr>
<td>True positive</td>
<td>False positive</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>C+D</td>
<td>B</td>
</tr>
</tbody>
</table>

Sensitivity: the proportion of persons with the health event that are identified by the surveillance system (A/(A+C)). Sensibilité: la proportion des personnes souffrant l'événement sanitaire qui sont identifiées par le système de surveillance (A/(A+C)).
Sensitivity may also be defined in terms of epidemics detected by the surveillance system rather than individual cases (Fig. 1). If one could enumerate all epidemics of a certain condition, the sensitivity of a surveillance system could be calculated as the proportion of the total epidemics detected by the system. For example, death-certificate data on pneumonia and influenza are reported weekly to the Centers for Disease Control (CDC) from 121 United States cities as part of the surveillance system. Using estimates based on historical data, the system is used to detect epidemics of influenza-related mortality. In an assessment of methods to analyse these data, alternative approaches were evaluated in terms of sensitivity, specificity and timeliness (31).

Specificity

Specificity is a measure of how infrequently a system detects false-positive health events. Quantitatively, it is the number of individuals identified by the system as not being diseased or not having a risk factor divided by the number of all persons who do not have the disease or risk factor of interest (Fig. 1). When applied to surveillance, specificity can be difficult to determine if the total population at risk is unknown. General population data may be available, but if a large portion of the population is not at risk (e.g. immune) the use of the total population as a denominator will provide an overestimate of specificity. Use of the true population at risk provides a more accurate estimate.

Given these difficulties in ascertainment, determination of the number of misclassified cases or false positives can be used as a measure of the failure of the system to correctly classify health events. In Fig. 1 the false-positive rate is B/A + B. For example, if 100 cases of silicosis were reported, but only 95 of those met an accepted case definition of silicosis, the false-positive rate would be 5/100 or 5%. A high rate of false positivity suggests that the system may be too sensitive (i.e. case definition is too permissive). While resources may be wasted in tracking these incorrectly classified reports, the system may still be useful if the risk to public health of a missed case is great (e.g. parahox contamination of a commercial food product).

Specificity, like sensitivity, can be applied to epidemics. Pseudo-epidemics (false positives) are not common, but recognition of such situations is important to avoid unnecessary concern of the lay and medical community, to identify previously unrecognized laboratory problems, and to minimize the misuse of resources (32-34).

Representativeness

A surveillance system that is representative accurately observes both the occurrence of a health event over time and the distribution by person and place of that event in the population at any point in time. To measure representativeness one can compare surveillance data covering part of a population to a sample assumed to be complete (e.g. death certificates for selected fatal events). To determine the representativeness of a surveillance system, the surveillance system collects reports on essentially all occurrences of a health event (e.g. total deaths to a vital registrar) then the system is by definition representative and further assessment of this attribute is not necessary.

The importance of the degree of representativeness depends on its possible effect on the public health response. The report of a few cases of a disease may trigger appropriate control efforts; non-representative reports may focus prevention activities away from populations at high risk (7). A precise assessment of representativeness requires carefully designed studies to obtain complete and accurate data for the health event in question. A study of medical-examiner records in Fulton County, Georgia, found that this data source was representative for intentional and unintentional injury, but was a weak predictor for other causes of death (P. Graeber, personal communication, 1986). A 1982 study of shigellosis reporting in Washington, D.C., found that the routine surveillance system was both incomplete and unrepresentative in terms of the socioeconomic status, race and residence of the population affected (7).

Timeliness

Timeliness is the interval between the occurrence of an adverse health event and (i) the report of the event to the appropriate public health agency, (ii) the identification by that agency of trends or outbreaks, or (iii) the implementation of control measures. Timeliness is related both to the incubation or latency period of the health event and to the efficiency of the preventive intervention. Because these parameters vary according to the health event in question, timeliness must be interpreted from the standpoint of the user. Recognition of an epidemic after it has run its course is of little immediate use for disease control, although the results of an investigation of such an event may be useful in future control efforts (e.g. recognition of the role of cooling towers in the spread of Legionnaires' disease (35)). Timeliness is particularly important for acute diseases that may occur in epidemic form. An epidemic of salmonellosis due to exposure to a contaminated commercial food product needs to be detected quickly and investigated rapidly to prevent further illness and possibly deaths (36). The surveillance of cancer, on the other hand, may not require as rapid a response although identification of particularly virulent kinds of carcinogen should be accomplished as soon as is feasible, so as to interrupt the exposure process. Consequently, data are typically reported on an annual basis which is sufficiently timely for designing and implementing intervention strategies.

In a 1982 CDC survey of state epidemiologists, the respondents cited lack of timeliness as a major deficiency in national surveillance systems. A study of national Shigella surveillance data indicated that the typical case of recognized shigellosis is brought to the attention of local health officials 11 days after onset of symptoms—a time sufficient for the occurrence of secondary and tertiary transmission to have already occurred (13). Such delays are common in infectious disease surveillance systems and, as a result, have prompted efforts to improve the timeliness of disease reporting (8, 10, 16). In two controlled studies of disease surveillance strategies for four acute infectious diseases, active, health-department-initiated surveillance was found not to improve the timeliness of disease reporting (8, 10). In fact, in one of those studies, reports tended to be more rapidly received from physicians passively reporting to the local health department than from active, health-department-initiated surveillance (10).

The results of a 1980 survey of state epidemiologists emphasized the increasing interest of health officials in the use of computers and computer-linked telecommunication networks to improve timeliness of surveillance data (37). The subsequent development and use of computer-linked telecommunication networks has decreased the time of data turnaround and enabled more complete analysis of reports (38). Within states, computers have been used to link local and state health departments (39). In France, a national system for the reporting of selected infectious diseases has been...
formed based on sentinel physician practices that are linked by computer (40). It remains to be documented whether computer-based reporting systems will lead to more rapid and effective interventions.

The existence of a recognized surveillance system indicates to a community the interest by the health department in certain health events and may lead to more rapid reporting. Providers as well as the public can use alternative reporting channels, such as the telephone, that would not be used in the absence of a recognized system.

Simplicity

Simplicity should be a guiding principle for epidemiological surveillance. Simple systems are easy to understand and implement, cost less than complex systems, and provide flexibility. At the same time, surveillance systems should not be so simple that they provide data that are not useful or may even be misleading. The impact that an increase in the complexity of a surveillance system would have on effective use of the system must be weighed against its increased cost. In a voluntary system, increased reporting burden might have a deleterious effect on the level of cooperation and productivity of those who report data. If the addition of information to a surveillance form compromises data quality or causes delays in data collection, the public health value of that system will diminish. Before asking for additional information, the impact of this added burden on these health departments should first be assessed in terms of data quality and reporter acceptance (see below).

Flexibility

Flexibility is a measure of the ability of a surveillance system to be easily adapted to new reporting needs in response to changes in the nature or the importance of the health event, the population monitored, or the available resources. When penicillinase-producing Neisseria gonorrhoeae (PPNG) was introduced into the United States in 1976, this new strain of bacteria was detected by the state-based system for the surveillance of gonorrhea (41). While laboratory methods had to be adapted to isolate the new organism, the same state-based epidemiological system previously established for gonorrhea surveillance was used to monitor the spread of the disease in the United States, to direct prevention and control programmes and to assess the impact of intervention procedures. This flexibility is a desirable feature of a surveillance system and is best assessed as new health problems emerge or alternative intervention strategies are adopted. The flexibility of a surveillance system can be assessed by the additional costs involved in modifying the system in some way. For example, a flexible system for homicide surveillance should be adaptable to both rural and urban settings, for hand guns, sharp instruments and other weapons, and for large and small health departments.

Flexibility can also be observed at another level. A surveillance system that can be used for monitoring new or emerging problems can be seen as flexible. The notable disease-reporting system maintained by state health departments, for example, has frequently been expanded to monitor new diseases such as toxic-shock syndrome, AIDS and silicosis.

Acceptability

Acceptability is measured by the willingness of persons conducting surveillance and those providing data to generate accurate, consistent and timely data. The acceptability of a particular system — especially one that is voluntary — is dependent upon the perceived public health importance of the health event under surveillance, recognition of the individual’s contribution to the system as it relates to control and prevention, and the time burden relative to available time. Surveillance methods must also be acceptable to those who provide the data. For example, as ill and well persons are asked for increasing amounts of information about their health status and lifestyle, the methods of data collection must ensure confidentiality while providing the data necessary for programme planning and evaluation. Even very subjective data can be obtained for surveillance if questions are asked properly and data are not misused (42). In this context, acceptability is measured by the proportion who refuse to participate.

The individuals working at each step in the surveillance system must be willing to collect and handle the relevant data in a prescribed manner. As new systems are developed, the burden on data handlers must be ascertained and the impact of modifications in surveillance must be taken into account.

The quantitative assessment of acceptability of a surveillance system has never been carefully conducted. Two 1980 national surveys of local health departments regarding the existing surveillance systems for measles and viral hepatitis found that both systems were acceptable to the staff of local health departments (97% and 96%, respectively, would continue routine reporting of these diseases) (18, 19), but this is only an indirect measure of acceptability. Because refusal to participate and incompleteness are not sufficient evidence of the unacceptability of a surveillance system, more careful evaluation of this attribute should be developed.

Discussion

This article describes an approach to the evaluation of systems of epidemiological surveillance. The primary question to be addressed in the assessment of a surveillance system is whether or not the information produced by the system is useful. Does the system contribute to understanding a public health problem or prompt action that leads to the reduction of morbidity and mortality or the promotion of health? If not, is the health event under surveillance of sufficient importance to warrant a more effective surveillance system? If the system is useful, can it be improved or maintained at less expense? In either event, the quality of epidemiological reporting systems can be assessed using the evaluation criteria based on seven attributes of surveillance systems formulated in this article. CDC is in the process of making this method operational so as to permit optimal management of public health activities at the local, state and federal levels.

The attributes of surveillance discussed in this article are interdependent, and the improvement of one may improve or compromise another. Increasing the sensitivity of a system to detect a greater proportion of a given health event in a population may also improve representativeness and usefulness yet lead to greater cost, lower specificity and more false-positive events. With some conditions such as influenza, investigators will use multiple sources of data in a surveillance system, some with high sensitivity (e.g. morbidity reports) and others with increased specificity (e.g. laboratory data). Similarly, efforts to increase timeliness may lead to increased cost and a loss of specificity as more resources are expended and incomplete, less accurate diagnostic information is collected. The incidence of a health event also affects the
interaction of sensitivity, specificity and timeliness of surveillance activities. For example, the surveillance of low-incidence health events often requires significant resources to increase sensitivity and timeliness, a phenomenon currently illustrated by efforts to control measles as part of the Measles Elimination Program (29).

Some aspects of evaluation are not addressed in this article. The proposed evaluation of both sensitivity and representativeness, for example, does not address the epidemiology of undiagnosed cases or problems associated with detection bias. A controversy arose around the importance of diagnostic and reporting biases inherent in the surveillance of toxic-shock syndrome that could lead both to unwarranted conclusions about the epidemiology of that health problem and to differences in interpretation among investigators (43, 44). In addition, changes in representativeness or sensitivity over time can result in misinterpretation of the data. For example, if reports of asbestos increase because of increased availability and diagnostic facilities in selected industries, this may be a result of the reporting change rather than any changes in the actual occurrence or distribution of the disease in the population.

Deficiencies detected in the evaluation of a surveillance system may relate to any part of the surveillance process—collection, analysis, dissemination or application of results to prevention. For example, the validity and reliability of surveillance reports are serious concerns for anyone using surveillance data. Quality control typically takes the form of review of coding accuracy and completeness of information on surveillance forms and is conducted periodically by health agencies. Follow-back to source data is a less common practice. While well-financed data-collection activities that have been used for surveillance, such as the Surveillance, Evaluation, and End Results Registry of the National Cancer Institute have rather sophisticated methods of quality control, other sources of routine surveillance are less rigorous (8, 45).

Deficiencies in quality control within a surveillance system may adversely affect its effectiveness and efficiency as reflected in the measures of the usefulness, cost and quality of such systems. Upon detecting problems, one can look at data analysis, dissemination or application to ascertain precisely at what point improvements in the system can be effected most efficiently.

Assessment of both ongoing and developing systems of epidemiological surveillance will help to make them more efficient and more effective. The public health community should continue to develop appropriate methods for the evaluation of surveillance, and individuals working in public health programmes at the national, state and local levels should be involved in the ongoing assessment of their surveillance activities.

**SUMMARY**

Epidemiological surveillance is the systematic collection, analysis and dissemination of health data for the planning, implementation and evaluation of public health programmes. Established surveillance systems should be regularly reviewed on the basis of explicit criteria of usefulness, cost and quality; systems should be modified as a result of such review. Attributes of quality include: (i) sensitivity, (ii) specificity, (iii) representativeness, (iv) timeliness, (v) simplicity, (vi) flexibility and (vii) acceptability. To date, evaluation of surveillance systems has been limited in scope and content. The evaluation method proposed in this article offers an organized approach to the evaluation of epidemiological surveillance systems.

The usefulness of a surveillance system is measured by whether it leads to prevention or control or a better understanding of adverse health events. The measure can be qualitative, in terms of the subjective views of those using the system, or quantitative in terms of the impact of surveillance data on policies, interventions or the occurrence of a health event.

The cost of a system includes indirect as well as direct costs, and should be measured in relation to the benefits obtained, such as reduction of medical-care expenses and of time lost from work. All elements of the system should be included in the cost: data collection, analysis and dissemination.

The sensitivity of a surveillance system is its ability to detect health events (completeness of reporting). Its specificity is inversely proportional to the number of false positives it reports. Reports of a disease that do not meet the case definition are false positives, and may result in resources being wasted in investigating them. However, in circumstances where it is extremely important not to miss a single true case, a certain level of false positives may be acceptable.

Representativeness can be measured by comparing surveillance data covering part of the population to either nationwide data, where available, or to random sample-survey data. A source may be representative for one particular disease or condition but not for another. Representativeness involves such factors as age, sex, ethnic group, socioeconomic status and residence. Timeliness involves not only the interval between the occurrence of the event and the receipt of the report at the health agency, but also the time subsequently required for identifying a problem or epidemic and the initiation of control measures. Timeliness is relative to the event concerned; for example, for most infectious diseases, the response should be made in a matter of days, whereas for cancer surveillance annual reporting may be adequate.

Simplicity in a system means it is easy to understand and implement, and is therefore usually relatively cheap and flexible. A flexible system is easily adapted by adding new notifiable diseases or conditions or extending it to additional population groups. However, care should be taken that the reporting burden is not thereby increased to an unacceptable level, leading to loss of data quality or timeliness. The acceptability of a system depends on the perceived public health importance of the event under surveillance, recognition of the contribution of individuals to the system, and the time required to make the reports. The surveillance method must be acceptable not only to the collectors of the data, for the reasons just mentioned, but also to the providers (both ill and well persons) in terms of confidentiality and cultural sensitivities. Thus, acceptability can be measured by the proportion of persons asked who actually complete a questionnaire.
The attributes of surveillance discussed are interdependent. Increasing the sensitivity of a system to detect a greater proportion of a health event may improve representativeness and usefulness, but also increase the cost and lead to the reporting of more false positives. Paradoxically, the less frequent the event, the more expensive it may be to keep under surveillance. It is also necessary to bear in mind that changes in representativeness or sensitivity can occur with time and lead to misinterpretation of the data, such as when improved diagnostic facilities lead to increased case reporting. Quality control of the system should go beyond spot checking of questionnaire completeness to periodic checking against the source data. Evaluation of surveillance systems is an essential prerequisite to improving their efficiency and effectiveness.

RÉSUMÉ

Une méthode d'évaluation des systèmes de surveillance épidémiologique

On entend par surveillance épidémiologique la collecte, l'analyse et la diffusion systématiques de données sanitaires pour la planification, l'exécution et l'évaluation des programmes de santé publique. Les systèmes de surveillance en vigueur doivent être revus périodiquement en fonction de critères précis en matière d'utilité, de coût et de qualité; les systèmes doivent être modifiés si les résultats de cet examen le justifient. Les attributs relatifs à la qualité sont: (i) la sensibilité; (ii) la spécificité, (iii) la représentativité, (iv) l'opportunité, (v) la simplicité, (vi) la souplesse et (vii) l'acceptabilité. Jusqu'à présent l'évaluation des systèmes de surveillance a été limitée quant à son ampleur et à son contenu. La méthode proposée dans cet article offre une approche rationnelle pour évaluer les systèmes de surveillance épidémiologique.

L'utilité d'un système de surveillance se détermine par la mesure dans laquelle il aboutit à une action de prévention ou de lutte ou permet de mieux comprendre les événements sanitaires défavorables. Cette détermination peut être qualitative, en fonction de l'opinion subjective des usagers du système, ou quantitative en fonction de l'impact des données de surveillance sur les politiques, les interventions ou la survenue d'un événement sanitaire.

Le coût d'un système englobe les dépenses indirectes aussi bien que directes et doit être mesuré au regard des avantages obtenus, tels que la réduction des dépenses pour soins médicaux et l'absentéisme. Tous les éléments du système doivent être inclus dans le coût: collecte, analyse et diffusion des données.

On entend par sensibilité d'un système de surveillance son aptitude à déceler les événements sanitaires (complétude de la notification). La spécificité du système est inversement proportionnelle au nombre des événements faussement positifs signalés. Les notifications d'une maladie qui ne correspondent pas à la description des cas sont dites faussement positives et il peut en résulter que l'enquête y afférente entraîne un gaspillage. Néanmoins, lorsqu'il est extrêmement important de ne pas omettre un seul cas réel, un certain taux de notifications faussement positives peut être acceptable.

On peut mesurer la représentativité d'un système en comparant les données de surveillance relatives à une partie de la population soit à des données concernant la totalité de celle-ci, si elles sont disponibles, soit aux données issues d'un sondage aléatoire. Il se peut qu'une source de données soit représentative de telle maladie ou affection, mais non de telle autre. La représentativité fait entrer en ligne de compte des facteurs tels que l'âge, le sexe, l'origine ethnique, la situation socio-économique et le lieu de résidence. La notion d'opportunité met en jeu non seulement l'intervalle entre la survenue de l'événement et la réception de la notification par l'établissement sanitaire, mais aussi le délai nécessaire pour identifier un problème ou une épidémie et engager des moyens de lutte. Le degré d'opportunité varie selon l'événement considéré; par exemple, pour la plupart des maladies infectieuses il faut réagir en l'espace de quelques jours, tandis que pour la surveillance du cancer une notification annuelle peut être suffisante.

Par simplicité d'un système, il faut entendre qu'il est facile à comprendre et à appliquer, de sorte qu'en général il est relativement souple et peu onéreux. Un système doué de souplesse peut être facilement adapté par l'addition de nouvelles maladies ou affections à déclaration obligatoire ou par son extension à de nouveaux groupes de population. Toutefois, il faut veiller à ce que la charge représentée par la notification n'atteigne pas de ce fait un niveau insupportable, ce qui aurait pour effet de réduire la qualité ou l'opportunité des données. L'acceptabilité d'un système dépend de l'importance attribuée à l'événement survenu pour la surveillance du point de vue de la santé publique. Il est la renaissance de la contribution que les particuliers apportent au système, et du délai requis pour communiquer les notifications. La méthode de surveillance doit être acceptable non seulement pour les responsables de la collecte des données, mais aussi pour ceux qui communiquent les données (qu'il s'agisse de malades ou de sujets bien portants), au regard de caractère confidentiel des renseignements et aux sensibilités culturelles. L'acceptabilité peut donc se mesurer par la proportion des personnes interrogées qui ont effectivement rempli un questionnaire.

Il existe une interdépendance entre ces attributs de la surveillance. Si on augmente la sensibilité d'un système afin de déceler une plus forte proportion d'un événement sanitaire, cela peut améliorer la représentativité et l'utilité, mais cela peut aussi accroître le coût et le nombre des notifications faussement positives. Si paradoxalement que cela puisse paraître, moins un événement est fréquent, plus son maintien sous surveillance se révèle coûteux. De même, il ne faut pas perdre de vue que la représentativité ou la sensibilité peuvent évoluer à la longue, d'où une interprétation erronée des données, par exemple quand l'amélioration des moyens diagnostiques entraîne un accroissement du nombre des cas notifiés. Le contrôle de la qualité d'un système doit aller au-delà d'une vérification ponctuelle de la complétude des questionnaires et comprendre une vérification périodique au regard des données d'origine. L'évaluation des systèmes de surveillance est une condition préalable essentielle pour en améliorer l'efficience et l'efficacité.
REFERENCES – RÉFÉRENCES


