Section 3
Surveillance to detect foodborne disease outbreaks

3.1 Introduction
Public health surveillance involves the systematic collection, analysis and interpretation of the morbidity and mortality data essential to the planning, implementation and evaluation of public health practice, and the timely dissemination of this information for public health action. The primary goal of surveillance for foodborne disease outbreaks should be the prompt identification of any unusual clusters of disease potentially transmitted through food, which might require a public health investigation or response.

3.2 Definitions
Some key terms are defined here to ensure clarity. Additional definitions are provided in Annex 1.

**surveillance**
The systematic collection, analysis and interpretation of data essential to the planning, implementation and evaluation of public health practice, and the timely dissemination of this information for public health action.

**foodborne disease**
Any disease of an infectious or toxic nature caused by consumption of food.

**foodborne disease outbreak**
Various definitions are in use:

a) The observed number of cases of a particular disease exceeds the expected number.

b) The occurrence of two or more cases of a similar foodborne disease resulting from the ingestion of a common food.

**sporadic case**
A case that cannot be linked epidemiologically to other cases of the same illness.

**cluster/outbreak/epidemic**
Epidemiologists may use “cluster”, “outbreak”, and “epidemic” interchangeably. Typically, “cluster” is used to describe a group of cases linked by time or place, but with no identified common food or other source. In the context of foodborne disease, “outbreak” refers to two or more cases resulting from ingestion of a common food. The term “epidemic” is often reserved for crises or situations involving larger numbers of people over a wide geographical area.

3.3 Data sources
Detecting outbreaks requires efficient mechanisms to capture and respond to a variety of data sources. In most countries, the main data sources for detecting foodborne disease outbreaks are:

- the public
- the media
- reports of clinical cases from health care providers
- surveillance data (laboratory reports, disease notifications)
- food service facilities.

The public

Members of the public are often the first to provide information about foodborne disease outbreaks, particularly when they occur in well-defined populations or at local level. Public health authorities should have guidelines on how to deal with and respond to such information: outbreak reports received by the public should never be dismissed without consideration.

When reports of an outbreak are received, the following information should be gathered:

- the person(s) reporting the outbreak;
- characteristics of the suspected outbreak (clinical information, suspected etiologies, suspected foods);
- persons directly affected by the outbreak (epidemiological information).

The challenge in dealing with these reports is to follow up on all relevant information without wasting resources in investigating a large number of non-outbreaks. The initial response can be facilitated if one individual is designated as the focal point for the event. This person should receive all additional information that is obtained from other sources, maintain contact with the person(s) reporting the outbreak, contact additional cases as appropriate and ensure that staff members of different departments (e.g. epidemiology, food inspection) do not contact cases independently or without each other’s knowledge. Standardized forms should be used to collect information about such events (see Annex 3).

The media

The media are usually very interested in foodborne outbreak reports and may devote considerable resources to detecting and reporting them. A local journalist may be the first to report an outbreak of which the community has known for some time. Public health authorities may first learn of a possible outbreak through media reports. Journalists may detect outbreaks that have been hidden from the health authorities because of their sensitive nature or because of legal consequences. Internet editions of regional or national newspapers and web-based discussion groups may provide a timely and accurate picture of ongoing outbreaks throughout the country or the region. However, media reports will inevitably be inaccurate at times and should always be followed up and verified. This will also help public health authorities in controlling public anxiety caused by outbreak rumours in the media.

Reports of clinical cases from health care providers

Health care providers may report clinical cases or unusual health events directly to the public health authorities. These reports may come from such sources as a doctor working in the emergency department of a large hospital, a general practitioner, a public health nurse with knowledge of the community, or the medical department of a large company. Information sharing of this kind is common and often enables faster and more efficient detection of foodborne outbreaks than legally-mandated reporting channels (e.g. statutory disease notification).
Information received by astute or concerned health care providers should always be followed up unless there are very good reasons not to do so. The rationale for not acting on such information should always be explained to the health care provider in order to maintain credibility.

**Surveillance data**

Surveillance activities are conducted at local, regional and national levels through a variety of systems, organizations and pathways (Borgdorff & Motarjemi, 1997). Among the many surveillance methods for foodborne disease, laboratory reporting and disease notification may contribute importantly to outbreak detection. Other types of surveillance that may be of value in detecting foodborne disease outbreaks are hospital-based surveillance, sentinel site surveillance, and reports of death registration. Generally, however, these are not primary data sources for detecting outbreaks and their usefulness will depend on the inherent quality of the systems and the circumstances in which they are employed.

**Laboratory-based surveillance**

Laboratories receive and test clinical specimens from patients with suspected foodborne disease (e.g. faecal samples from patients with diarrhoea). Often, positive microbiological findings from these specimens are also sent by laboratories to the relevant public health authorities. In addition, some laboratories send patient material or isolates to a central reference laboratory for confirmation, typing or determination of resistance patterns. The collation of these reports and their systematic and timely analysis can provide useful information for detecting outbreaks, particularly when cases are geographically scattered or clinical symptoms are nonspecific.

Detecting outbreaks is facilitated by early typing of isolates of foodborne pathogens. Routine typing may detect a surge of a particular subtype and link apparently unrelated infections. Interviewing affected individuals about their food consumption may then identify contaminated foods that may have not been recognized otherwise.

Other factors that determine the usefulness of laboratory reporting in the detection of outbreaks include the proportion of cases from whom specimens are taken for laboratory examination, how often laboratories send their reports, how complete these reports are, how many laboratories participate in the reporting and whether the tests employed allow direct comparison of results.

Traditional laboratory-based surveillance is “passive”, i.e. dependent on laboratories to report cases to public health authorities. In some situations, such as when a potential problem is suspected, “active” surveillance may be warranted for a period of time: laboratories may then be actively and regularly contacted by food safety or public health authorities to enquire about recent positive tests indicative of potential foodborne diseases.

**Disease notification**

In most countries medical practitioners are required to notify public health authorities of all cases of certain specified diseases. Notification of cases is usually based on clinical judgement and may not require confirmation by other diagnostic means.

It is widely recognized that most statutory disease notification systems suffer from substantial under-reporting of diagnosed cases and long delays in notification. Moreover, many people
with foodborne disease do not seek medical advice or will not be diagnosed as suffering from a foodborne disease because of the nonspecific nature of their symptoms. Notification of laboratory-confirmed illnesses is thus substantially more likely. Medical practitioners who become aware of unusual clusters of diarrhoeal disease or other syndromes that may indicate foodborne disease should also be urged to report these promptly to public health authorities.

Other sources

Other sources may alert public health authorities to the occurrence of outbreaks. Often, some creativity is needed to detect outbreaks as many of these sources were created for other purposes. Examples include reports of increased absenteeism from the workplace, schools or child-care facilities, pharmacy reports of increased drug sales, e.g. of anti-diarrhoeal medications, and consumer complaints to health departments or food regulators. Outbreaks may be anticipated after an increased risk of population exposure has been detected, for example contaminated drinking-water or contamination of a commercially available food product.

3.4 Interpreting data sources

Outbreaks are often detected when sick people share an easily recognized potential source of infection (such as in schools, hospitals, nursing facilities, correctional facilities, etc.). When such events are limited to small, well-defined populations, the number of affected persons can usually be quickly established. The main emphasis of an investigation is on verifying that an outbreak has indeed occurred and controlling its spread.

Detecting community outbreaks from surveillance data can be more difficult. Above all, it requires the timely collection, analysis and interpretation of the data to indicate whether the number of observed cases exceed expected numbers. This requires knowledge of the background rates or traditional disease patterns in a particular population at a particular time and in a particular place, including typical seasonal changes in disease occurrence. A small local outbreak may be missed by regional or national surveillance; conversely, a widespread national outbreak may not be detectable by regional or local surveillance. A sudden increase in disease occurrence may clearly point towards an outbreak (see Figure 2) while small changes in baseline levels can be difficult to interpret (see Figure 3). Even if the overall number of cases is not unusually high, a steep increase confined to a subgroup in the community or to a particular subtype of pathogen may be significant (see Figure 4).

Local health authorities will usually know if more disease is occurring than would normally be expected. Where there is doubt, seeking additional information from other sources (e.g. absenteeism reports, telephone survey with general practitioners, checking outpatient departments of major hospitals, etc.) may help in the interpretation of surveillance data.

There are causes other than outbreaks that may lead to increased number of observed or reported cases. These are referred to as “pseudo-outbreaks”; examples include changes in local reporting procedures or in the case definition for reporting a specified disease, increased interest as a result of local or national awareness, changes in diagnostic procedures, or heightened concern among a specific population (e.g. “psychogenic” outbreaks). In areas subject to sudden changes in population size – such as resort areas, college towns, farming areas with migrant workers – changes in the numerator (number of reported cases) may only reflect changes in the denominator (population size).
Figure 2. **Weekly number of reported cases indicating an outbreak in week 34**

Figure 3. **Weekly number of reported cases where it is not clear whether or not the observed number of cases in week 34 has exceeded expected numbers**

Figure 4. **Weekly number of *Salmonella* isolates: the outbreak of *S. agona* may have been missed without data on specific serotypes**