European antimicrobial resistance surveillance as part of a community strategy
Bronzwaer, Stephan Louis Adrianus Marie

Citation for published version (APA):
Chapter 2

Objectives and set up of the European Antimicrobial Resistance Surveillance System (EARSS)

Introduction
In 1997 a prioritisation exercise was carried out among heads of national surveillance centres in the Member States of the European Union. Antimicrobial resistance ranked in the top five areas in communicable disease surveillance for which the development of a network was deemed a high priority (1).

‘Effective European surveillance must have the agreement and active involvement of all participants’, concluded the Microbial Threat conference on the need for surveillance of resistant micro-organisms, held in September 1998 in Denmark (2). Patterns of antibiotic resistance differ widely between member states of the EU (3, 4), and different studies suggest that policies and guidelines on antibiotic usage may affect the prevalence of resistance (5, 6). From an epidemiological and methodological standpoint it is difficult to compare antimicrobial resistance rates because of differences in antimicrobial agents tested, sampling policies, susceptibility test systems used, and breakpoints adopted.

To obtain more comparable and validated data, the European Commission, Directorate General Health and Consumer Protection, made funds available to implement a European Antimicrobial Resistance Surveillance System (EARSS). This system is coordinated by the Rijksinstituut voor de Volksgezondheid en Milieu (RIVM), the National Institute of Public Health and the Environment of the Netherlands. In 1998, more than 400 laboratories expressed willingness to take part in this European surveillance network. This chapter describes objectives and set-up of EARSS.

Objectives
EARSS is an international network of national surveillance systems, aiming to collect comparable and validated antimicrobial resistance data for public health purposes. Taking into account laboratory methods as well as epidemiological principles, EARSS will explore the feasibility of analysing regional differences, assessing risk factors, and providing electronic feedback. EARSS started on 1 April 1998 with an 18-month feasibility study. During the first plenary meeting, with a microbiologist and an epidemiologist representing every country, it was decided that EARSS will concentrate on Streptococcus pneumoniae and Staphylococcus aureus during the pilot phase; with more pathogens added later. The system will use routine data from laboratories so that no changes to the primary diagnostic process will be needed. The participants will gather unbiased samples of isolates by either total or representative coverage. The objective for S. pneumoniae is to collect susceptibility data on penicillin and cephalosporins, and possibly other drugs, from blood and cerebrospinal fluid isolates. For S. aureus, in particular data on methicillin resistance will be collected from isolates from blood.
EARSS aims to assist in the control of antimicrobial resistance, by performing antimicrobial resistance surveillance at national and European level, and has set the following objectives:

- collecting susceptibility data in standardised manner, thereby improving comparability
- providing information to target interventions (at local, national, and EU level)
- providing official national AMR data that constitute a basis for policy decisions
- analysing temporal / geographical trends: monitoring AMR data over place (among different European countries) and time (from year to year).
- providing feedback to ‘those who need to know’, for evaluating interventions and follow the effect of policy decisions.

Furthermore, EARSS aims to stimulate:

- national antimicrobial resistance surveillance and provision of information for national policies
- linkage of antimicrobial resistance data to antibiotic use data
- European research in the field of antimicrobial resistance

**Organisation**

Each participating country has appointed a national representative microbiologist and a representative epidemiologist. One of the representatives from each country acts as the national coordinator. His/her main task is to coordinate activities of the participating laboratories; arrange distribution and collection of questionnaires on susceptibility testing; and to collect and forward resistance data each quarter for international collation.

![EARSS Network organogram](image)

**Figure 2.1: EARSS Network organogram**
Standardisation and microbiological quality control methods are being developed in consultation with the European Society of Clinical Microbiology and Infectious Diseases (ESCMID). EARSS is a component of the network-of-networks being established by the World Health Organization (WHO) for global surveillance.

Selection of participating laboratories
EARSS recommended that the national coordinators should select enough laboratories in their countries to cover at least 20% of the total population. For the community acquired pathogens the catchment population of the laboratories (the number of people living in the area they serve) will be considered as the denominator. The 400 or so laboratories participating in EARSS will cover well over 20% of the population in many countries.

Epidemiological data
EARSS collects the following data by means of isolate record forms and questionnaires:
• information about an isolate and its susceptibility test results
• information about patients
• information about the laboratory methods used and denominator data
• data about the hospital(s) served by the laboratory used to generate the denominator.

Isolate record form. This form collects information about patients and isolates. EARSS requires the following information: sex, month and year of birth, date of specimen collection, name or code of hospital, hospital department, origin of patient, isolate specimen number, laboratory code, and antibiotic susceptibility testing results as specified in the protocol. Furthermore, the isolate record form allows other optional data to be collected: patient identifier, clinical diagnosis, and susceptibility data for other antibiotics.

Questionnaire on susceptibility testing. This questionnaire asks about test methods used, and collects denominator data from a laboratory and from the hospital(s) it serves. The facilities the hospital offers (intensive care unit, renal, transplant, cardiac surgery) and the number of bed days are requested. For nosocomial pathogens the number of bed days will be considered as the denominator. Data on patients and isolates can be related to information about the laboratory and hospital by means of a unique laboratory code that will be filled out on all isolate record forms and questionnaires. We are aware that the catchment population estimated by a laboratory may overestimate the true catchment population. True catchment populations can be calculated through postal codes of the patients from whom isolates were obtained. To preserve confidentiality this must be done at a national level.
Duplicates
To prevent duplicate isolates from being reported, laboratories are asked to send information only about the first isolate of each strain from each patient. These are referred to as ‘patient-isolates’. To be able to correct for duplicate isolates, the isolate record form asks for patient ID/code. This is marked as optional information, since in many countries there are legal limitations on the inclusion of patient identifiers. For the same reason we do not ask for date of birth, but month and year of birth. A code is needed, however, to exclude duplicates at the national level. If a patient identifier cannot be used in a particular country, we ask laboratories to use another (encrypted) code for a specific patient. In other countries the patient identifier may be used to exclude repeat isolates, removing the identifier before sending data to the central database.

Data processing
Participating laboratories are offered two methods of data entry: electronically and on paper. Details vary from country to country, but if a laboratory opts for electronic data transfer they can use an existing laboratory information system or make use of Whonet (and/or Whonet-Baclink). WHO revised the existing microbiology laboratory database software Whonet for EARSS. Laboratories that do not process data electronically will forward the isolate record forms to their national coordinator, who will perform the data entry and will send data each quarter to the RIVM in ASCII fixed or tab separated format. On receipt, the data will be checked for syntax errors (for example, dates and test results). After this validation, tables, figures, and geographical maps can be generated and published on the internet site. The aggregated data sets will also be used for more complex epidemiological studies, for example investigating relationships between antimicrobial use and resistance.

Feedback
Sufficient and timely feedback is essential for all surveillance systems. Information on resistance is needed at local, national, and international levels to guide decision making and interventions. As well as information letters and a newsletter, data will be shared using the electronic infrastructure Health Surveillance System of Communicable Diseases (HSSCD) network of the EU. Feedback, in the form of standard reports, is already provided by means of the EARSS web site, newsletters and publications.

Results
About 400 laboratories will take part by sending data via national coordinators to the central EARSS database. Data collection began in some countries on 1 October 1998. The EARSS protocol and issues like ownership of data and data management were agreed by all national co-ordinators and laid down in the EARSS manual (7). The manual has been
distributed to participating laboratories. By the end of 1999, questionnaires on test methods and denominators from 283 laboratories had been received. These laboratories serve 450 hospitals, mainly general hospitals (76%) but also academic/tertiary hospitals (20%) and nursing homes (4%). Ninety-five per cent of the 150 laboratories that specified which method they used undertook susceptibility testing of *S. aureus* against oxacillin and/or methicillin routinely. About half of these laboratories use Mueller-Hinton agar (sometimes with salt) and follow the National Committee for Clinical Laboratory Standards (NCCLS) recommended breakpoints. By the end of the pilot phase, laboratories from 12 countries (Belgium, Denmark, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Portugal, Sweden, United Kingdom) were sending data.

**Conclusion**

In developing the protocol and questionnaire, the challenge was to balance scientific validity and feasibility. A first result is that consensus has been reached by leading microbiologists and epidemiologists on the protocol and logistical framework. The feasibility phase yielded a conclusion that EARSS is needed and feasible, and that it must run continuously with guaranteed funding. The number of pathogens under surveillance will be expanded as soon as the data processing has been optimised. EARSS is already acting as a catalyst for national surveillance systems, such as in Ireland (8).

**References**