Case study 2:

Epidemiological Sentinel System: Workflow Description at Care Centre, Microbiology Centre and Epidemiological Information Centre:

This case study describes (in a slightly simplified form) the work of a European project in the control of antibiotic-resistant infections in children. Often, children are asymptomatic carriers of bacteria that they can pass on to other children by playing with the same toys, touching each other, and so on. The research design involves two entities and three types of entity as described in the extract below.

The epidemiological system includes two entities: human hosts and infectious organisms. The medical infrastructure in place to monitor, contain and destroy the infectious organism typically involves a medical practitioner that collects samples from human individuals and sends them for further analysis. Consequently, three levels of operation can be recognized:

1. the field level – where the medical practitioner interacts directly with the potential human hosts, collects samples and basic characterization of the individual and sends the sample for further analysis at the next level, the microbiological/biochemical laboratory;

2. the laboratory level – this corresponds to the facilities that process the samples sent in from the field level.

3. a central location – where data integration and decision making takes place.

Typically, the human host is mostly characterized at the field level and the infectious organism is characterized mostly at the laboratory level.

In our case study, Care Centres, Microbiology Centre and the Epidemiological Information Centre represent the three levels.

(a) At the Care Centre (for example, a nursery school), within a Care Centre Period, swabs are taken from children's noses for analysis.

The Care Centre Operative collects these swabs, referred to as C Samples together into a C Sample Batch to send to the Microbiology Centre.

This is usually done one class or group of children at a time. These are called Care Centre Units and the period when their swabs are taken is called the Care Centre Unit Period – this must fall within the Care Centre Period.

The Care Centre Operative records all the necessary details (id numbers, etc) in order to ensure that the link between Attendee (i.e. a child) and his or her C Sample is maintained.
At the Microbiology Centre (usually a laboratory), the Microbiology Centre Operative receives a batch of samples, i.e. a C Sample Batch. She records them as M Sample Batches in the local system and then reorganizes them into one or more Sample Analysis Groups to suit the process at the Microbiology Centre. (To make this point clearer, imagine that one Care Centre Unit sends 19 swabs to the Microbiology Centre, another sends 22 and a third 26. The Microbiology Centre can process, say, 35 swabs at a time. The three distinct M Sample Batches – of 19, 22 and 26 – are reorganized into two Sample Analysis Groups of 32 and 35 respectively.)

Each swab is cultured on a Petri dish and an attempt is made to isolate different strains of bacteria and then to identify them. This is done using various tests, the main ones being:
- by serotype;
- by antibiogram;
- by pulse field gel electrophoresis (PFGE).

Information about strains identified in each swab is sent back to the Care Centre.

Information about strains is also sent to the Epidemiological Information Centre. The role of this centre is partly to organize and manage the overall campaigns (e.g. to define the Care Centre Periods) but, more importantly, it determines whether alarms must be raised and to what level.

For example, if any antibiotic resistant strains are present, an alarm is raised. However, actions at the Care Centre following an alarm vary from country to country. In Sweden the children must be sent home and the parents are paid by the state to stay at home with them. In Portugal, they are also likely to be sent home, but they return earlier because there is no social provision.

If a situation is deemed serious enough, a Care Centre may be closed for a time.