



Proposal for a European Strategy for  
Syndromic surveillance

Deliverable 9, Work Package 6

2013

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*These guidelines arise from the project Triple S-AGE which received funding from the European Union, in the framework of the Health Program. The sole responsibility lies with the author(s) of this report and the Executive Agency is not responsible for any use that may be made of the information contained herein.*



# Proposal for a European Strategy for Syndromic Surveillance

Toward comparability of  
reporting from syndromic  
surveillance systems in Europe

**TRIPLE**••**S**  
Syndromic Surveillance **Systems** in Europe

## Acknowledgments

The Triple-S project was coordinated by the French Institute for Public Health Surveillance (InVS).

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**Triple-S consortium:** we would like to thank the other members of the consortium for their contribution to the project: Céline Caserio-Schönemann, Helena Medeiros, Marta Sala-Soler (InVS, France), Alex Elliot (Public Health England, UK), Arlene Reynolds, Jim McMenamin (Health Protection Scotland, UK), Françoise Wuillaume (Institute of Public Health, Belgium), Bart van der Zanden (Swedish Institute for Communicable Disease Control, Sweden), Susanna Conti, Grazia Rago, Mark Kanieff (Istituto Superiore di Sanita, Italy), Mikko Virtanen, Satu Murtopuro (National Institute for Health and Welfare, Finland), Anna Páldy, Janos Bobvos (National Institute of Environmental Health, Hungary), Hervé Chaudet (University of the Mediterranean Aix-Marseille II, France), Liselotte van Asten (National Institute for Public Health and the Environment, Netherlands), Paulo Lauriola (International Society of Doctors for the Environment, Italy).

**Advisory board:** Triple-S would also like to thank the members of the board: Howard Burkom (Johns Hopkins University for the International Society for Disease Surveillance – ISDS), Isabelle Devaux (European Centre for Disease Prevention and Control – ECDC), Fernanda Dorea (National Veterinary Institute, Sweden), Jurgita Kaminskaite (Executive Agency for Health and Consumers, Health Unit, European Commission), Franz Karcher (DG Health and Consumers, European Commission), Bettina Menne (World Health Organization Regional Office for Europe), and other contributors who reviewed the proposal and helped enrich it, including Helmut Brand (Maastricht University, The Netherlands), Thierry Cardoso, Anne Gallay (InVS, France), Michael Saklad (Saklad Consultants for communications strategy), Anne-Catherine Viso (InVS, France).

We would also thank Sarah Moncrieff for formatting and designing this document.

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## Glossary

(A)H1N1: Influenza A virus subtype H1N1

ECDC: European Centre for Disease Prevention and Control

EEA: European Environment Agency

EFSA: European Food Safety Authority

EU: European Union

EuroMomo: European project for Monitoring mortality in Europe

EWRS: Early Warning and Response System

HSC: Health Security Committee

IHR: International Health Regulations

ISDS: International Society for Disease Surveillance

MedISys: The European Commission's Medical Information System

OIE: World Organisation for Animal Health

RAS: Rapid Alert System

SARS: Severe acute respiratory syndrome

SIDARTHa: European Emergency Data-based System for Information on, Detection and Analysis of Risks and Threats to Health

SyS: syndromic surveillance

TESSy: The European Surveillance System

WHO: World Health Organisation

# Executive summary

From SARS to H1N1, from heat waves to volcanic ash clouds, from bioterrorist threats at G8 summits to mass gatherings at Olympic Games, and from financial crises to refugee camps, Europe faces new, unprecedented challenges for its populations' health and security.

These challenges require that decisions be taken quickly, rumours be controlled early and cross-border comparisons be made in timely fashion. But the reporting needed for these purposes can take too long and information is often lacking about unforeseen events.

## **Our changed world needs tools that address new health threats**

In our hitherto more predictable world, traditional public health surveillance in Europe proved valuable by monitoring confirmed cases of specific diseases or agents that cause disease. But the new challenges require enhanced, coordinated surveillance of a broader range of indicators to complement traditional surveillance.

For this purpose, the 2005 revision of WHO's International Health Regulations and the proposal for a Decision of the European Parliament and of the Council on serious cross-border threats to health require that European countries shift from monitoring only specific, predefined infectious diseases towards an integrated, all-hazard approach covering a wide range of known and unknown communicable and non-communicable health threats.

Syndromic surveillance (SyS) can play a crucial role in performing this new task for European institutions and European Union (EU) member states by providing situational awareness and early warnings, corroboration and rumour control of potential adverse health effects.

## **Syndromic surveillance grows in Europe**

SyS has been growing steadily in Europe. Today, more than 15 European countries conduct SyS on a local, regional or national level, drawing on diverse data sources and aiming at a range of health risks.

Since 2008, three European projects (EuroMomo, SIDARTHa, Triple-S) have reviewed evidence for the usefulness of SyS and have assessed the possibilities for harmonisation to increase European comparability and cross-border surveillance capacity. The Triple-S project was set up in 2010 with the following objectives:

- review, analyse and inventory human- and animal-health SyS activities across Europe
- facilitate networking and knowledge exchange among parties active and/or interested in SyS
- draft guidelines for implementing SyS systems in human and animal health in EU member states
- propose a European strategy for SyS.

### Three models for European syndromic surveillance

The Triple-S project, in conjunction with the SIDARTHa and EuroMomo consortiums, proposes three models for enhancing the use and integration of SyS to support public health surveillance in Europe.

- Model 1** Fully decentralised systems with different data sources, syndrome definitions and non-standardised reporting. This model describes the current situation where member states already have SyS systems in place or want to create them.
- Model 2** Decentralised data collection but standardised reporting of findings and communication protocols for individual member states' systems.
- Model 3** Data collection and analysis that are fully centralised in a single European institution or location with standardised data reporting from member states.

The models progress from decentralised to centralised data collection, analysis and reporting. Model 1, with non-standardised summary reports, affords the least comparability, while the detailed sharing of Model 3 provides the most.

It is important to point out that parallel implementation of the three models is proposed, depending on the objective of surveillance and on data comparability. For some syndromes or health risks it is recommended and feasible to aim for a fully centralised model (Model 3), while for others a less integrated system is more suitable.

### Syndromic surveillance integration in Europe needs coordination

No single institution in Europe coordinates cross-border surveillance and response to animal- and human-health threats of a communicable or non-communicable nature. Currently, three main types of players are active in public health surveillance:

- Member states, including players at local, regional and national levels (data providers, public health authorities, health care providers, policy makers, etc)
- European bodies (e.g. ECDC, EFSA and EEA) and international organisations (e.g. WHO, OIE and ISDS)
- European public health surveillance networks and health information systems (e.g. EuroMomo, EWRS and MedISys).

To increase and improve the use of SyS in Europe, a fourth player is needed in the form of a syndromic surveillance coordination group. This group, operating as a network of SyS experts fully integrated with the European public health surveillance landscape would:

- **advise** member states and EU institutions on using and improving SyS according to the Triple-S guidelines (Model 1)
- **promote comparability** of findings for certain specific syndromes by providing central interpretation and dissemination of member states' SyS outputs (Model 2)
- **analyse** centrally collected data from member states on certain specific syndromes for comparable and timely cross-border surveillance (Model 3).

# Introduction

## What is SyS?

Several definitions of syndromic surveillance (SyS) already exist (Katz et al., 2011). However, the Triple-S project agreed on the following definition:

“The real-time (or near real-time) collection, analysis, interpretation, and dissemination of health-related data to enable the early identification of the impact (or absence of impact) of potential human or veterinary public health threats that require effective public health action. SyS is not based on laboratory-confirmed diagnoses of disease but on non-specific clinical signs, symptoms and proxy measures for health (e.g. absenteeism, drug sales, animal production collapse) that constitute a provisional diagnosis (or ‘syndrome’). The data are usually collected for purposes other than surveillance and, where possible, are automatically generated so as not to impose an additional burden on data providers. Although SyS tends to be non-specific, it can be sensitive and rapid, and can augment and complement the information provided by laboratory based surveillance systems.” (Triple-S, 2011).

## Why propose a European strategy for SyS?

### Public health decision-making faces a changing, complex environment

Traditionally, public health surveillance in Europe has focused on infectious diseases, and mainly monitored confirmed cases of a specific disease or agents that cause disease. This type of surveillance has repeatedly proven its value in controlling and preventing epidemics. However, public health decision-making faces a changing, complex environment that creates emerging and unprecedented levels of risk. Examples include extreme heat waves, volcanic ash clouds, violent flooding and storms, industrial and chemical accidents, new microorganisms and heavy influxes of refugees. At the same time, increased cross-border mobility can accelerate the spread of infectious diseases, as seen in the recent coronavirus threat. All these events emphasise the need for enhanced, coordinated surveillance with a broader range of indicators than in traditional, specific case-based surveillance.

These changed circumstances mean public health surveillance must now deal with more frequent requests for (near) real-time and real-time information on a very wide range of potentially health-threatening events. In addition, some situations require immediate risk assessment and interventions as their potentially large impact on public health means authorities cannot wait for a confirmed diagnosis before taking action.

To meet these challenges, the 2005 revision of WHO's International Health Regulations (IHR) and the proposal for a Decision of the European Parliament and Council on serious cross-border threats to health (European Commission, 2011) require that European countries shift from only monitoring specific, predefined infectious diseases towards an integrated, all-hazard approach that covers a wide range of known and unknown communicable and non-communicable health threats.

For this purpose, member states needed to enhance their surveillance and response mechanisms within five years of the IHR coming into force in 2007 in order "to detect events involving disease or death above expected levels for the particular time and place in all areas within the territory of the State Party"; "to report all available essential information immediately to the appropriate level of health care response"; and "to assess all reports of urgent events within 48 hours" (WHO, 2005). More than one-third of the European WHO member states asked for an extension of this deadline to meet the new requirements; in the meantime, meeting the core requirements for surveillance and response remains one of the key challenges.

### **How SyS can help meet the new public health surveillance requirements**

SyS can provide crucial help with the growing number of requests for (near) real-time information and immediate risk assessment of a range of public health threats, making it a useful tool for meeting the IHR requirements (Paterson et al., 2013).

SyS can be set up at relatively low cost, using existing real-time data sources and standard computer hardware and software. This makes it an attractive tool for countries with limited resources (Paterson et al., 2013). It can be used to help individual countries monitor in a timely manner events that pose a risk to neighbouring countries and share the results with them and European Union (EU) institutions. For certain health threats, a common European SyS approach can increase the comparability of surveillance results and enhance timely cross-border surveillance and response.

Unfortunately, many EU member states have developed SyS systems to meet national, rather than European, priorities. To address this situation, since 2008 European initiatives (European Conference on syndromic surveillance in October 2008, European SIDARTHa<sup>1</sup> project 2008–2010, EuroMomo project<sup>2</sup> 2008–2011 and Triple-S<sup>3</sup> project 2010–2013) have both increased awareness of SyS activities in European countries and shared SyS expertise to facilitate integration and assess harmonisation of SyS systems across EU member states.

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1. [www.sidartha.eu/about.html](http://www.sidartha.eu/about.html)

2. [www.euromomo.eu](http://www.euromomo.eu)

3. [www.syndromicsurveillance.eu](http://www.syndromicsurveillance.eu)

## What does the Triple-S project propose?

The Triple-S project (Syndromic Surveillance Systems in Europe) was launched in 2010 for a three-year period ending in 2013 (Triple-S, 2011). Coordinated by the French Institute for Public Health Surveillance (InVS), 24 organisations in 13 countries have worked to achieve the following objectives:

- review, analyse and inventory human and animal health SyS activities across Europe
- facilitate networking and knowledge exchange among those parties active and/or interested in SyS
- develop guidelines for implementing SyS systems in human and animal health in EU member states
- propose a European strategy for SyS.

To meet the last objective, Triple-S, in conjunction with the EuroMomo and SIDARTHa consortiums, proposes a European strategy to promote the implementation of SyS in Europe in response to the IHR and the European Commission Decision proposal.

In the following sections, this document describes the usefulness of SyS for health monitoring, risk assessment and public health response in Europe. It then analyses three potential models for implementing SyS in Europe, and makes recommendations for the creation and sustainability of these models by describing the integration of SyS in the existing landscape of public health surveillance stakeholders and information systems.

The proposal for the three models is based on discussions among the Triple-S partners and on the findings of the Triple-S project. The latter includes an inventory of human and animal health SyS systems in Europe, a systematic literature review on SyS data sources, and the insights from visits to SyS systems in various countries. (Conti et al., 2012; Dupuy et al., 2013; Ziemann et al., 2013(a); Medina et al., 2013; Ziemann et al., 2013(b))

# Usefulness of SyS for health monitoring, risk assessment and public health response

## How can SyS contribute to public health surveillance in general?

SyS is part of public health surveillance, the latter being an umbrella term that also includes specific surveillance of identified human and animal diseases, disease-causing agents and health risks. Specific surveillance generally uses laboratory reports, notifications of diagnoses by clinicians and case reporting.

As part of public health surveillance, 'epidemic Intelligence' is defined by the European Centre for Disease Prevention and Control (ECDC) as "the process to detect, verify, analyse, assess and investigate public health events that may represent a threat to public health". Epidemic intelligence encompasses activities related to early warning, signal assessment and outbreak investigation (Kaiser et al., 2006). In Europe, this event-based surveillance has mainly been used for communicable diseases and not for environmental and other potential threats.

Through the monitoring of provisional diagnosis or syndromic groupings of signs and symptoms (referred to as *syndromes* hereafter), SyS serves public health surveillance in a broad spectrum of events, including communicable diseases, environmental risks and mass gatherings.

SyS can be of great help in providing 'situational awareness' and early warnings, corroboration and rumour control for potentially adverse health effects. Specifically, situational awareness provided by SyS can help public health institutions monitor key aspects of a threat, including its severity and geographic extent, the population at risk and the dynamics of its evolution. SyS also can identify increases in illness rates (or proxy indicators of illnesses) before diagnoses are confirmed and reported to public health agencies. SyS achieves this by analysing existing real- or (near) real-time data and interpreting it with the aim providing more timely information for monitoring and warning of infectious disease outbreaks, epidemics or pandemics, potential bio-terrorist attacks, environmental events or major chemical or industrial incidents.

Individuals working on SyS systems have found situational awareness to be one of the most useful benefits of SyS on a day-to-day basis. Additional benefits include early detection of public health incidents and reassurance on the lack of impact of events on public health. The Triple-S inventory of SyS in Europe (Conti et al., 2012; Dupuy et al., 2013) also found that situational awareness and outbreak detection were the two most common aims of SyS.

## How can SyS contribute to public health surveillance in Europe?

Currently, the main ECDC surveillance strategy is to link microbiological, clinical, immunological and exposure data to understand events across more than one member state. However, Europe has no joint strategy to monitor indicators of non-infectious threats or non-specific indicators that may reflect a broader range of hazards. Given this situation, with recognition of the value of the all-hazard approach for European preparedness, SyS could play a useful part in the EU's public health surveillance strategy, complementing specific case-based surveillance. European public health surveillance networks in all surveillance fields (infectious diseases, environmental health, chronic diseases, emergent diseases, etc.) should cooperate to support the investigation and analysis of public health events or threats as described in the One Health initiative (CDC, 2012).

Specifically, SyS has started developing synergies between human and animal health surveillance. Veterinary and human health surveillance complement each other by addressing diseases common to both (zoonoses) by seeking early detection via sentinel animals (e.g. for West Nile Virus); using similar epidemiological and statistical tools; and helping interpret alarms from human systems. Sharing knowledge could improve SyS system performance for surveillance of human and animal diseases in terms of timeliness, sensitivity and awareness. Indeed, one of the major issues of SyS is the production of non-specific alarms that need to be investigated. Simultaneous alerts from both human and animal systems may add confidence in a signal suggesting the presence of a health threat and improving specific surveillance (Dupuy et al., 2013).

In a separate initiative, the Wildlife Conservation Society in 2004 initiated a global and preventive approach for public health surveillance called One World-One Health<sup>4</sup>. Its objective is to strengthen the links between the sectors of human health, animal health and the environment, because none of the sectors alone has enough knowledge and resources to detect or prevent the emergence or resurgence of diseases in today's interconnected world (One Health Initiative, 2013). As a start, seven veterinary systems in Europe already share their outputs with human-health institutes; three more systems plan to do so (Dupuy et al., 2013; Paterson et al., 2013).

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4. [www.wcs.org/conservation-challenges/wildlife-health/wildlife-humans-and-livestock/one-world-one-health.aspx](http://www.wcs.org/conservation-challenges/wildlife-health/wildlife-humans-and-livestock/one-world-one-health.aspx)

## Main benefits of SyS systems for public health surveillance

Based on non-specific and wide-ranging health indicators, and can so help detect a broad range of events (expected or unexpected)

Often based on symptoms reported to health services in the previous 24 hours, and may thus indicate an increase in the occurrence of symptoms before laboratory confirmation

Can detect symptoms of known or emerging diseases for which there are no existing disease-specific surveillance systems

Can validate and support alerts generated by other surveillance systems across Europe (e.g. event- and indicator-based surveillance systems)

Can be used for short-term surveillance during mass gatherings (e.g. sporting events)

Can identify suspected infected persons for microbiological sampling (e.g. during influenza epidemics)

Can be used for surveillance of earthquakes, tsunamis and other catastrophic events that can affect and sometimes displace large populations

Can provide (near) real-time information for media enquiries about population health in the event of a public health emergency

Can identify potential signals and provide outputs that may help decision makers take early action

Can strengthen public health networks by following up SyS alerts

Can, in some cases, be relatively inexpensive to create (compared to disease-specific surveillance systems), because it is usually based on data that is already collected

## Examples of the usefulness of SyS in Europe

Following are specific examples highlighting how SyS has already been useful in Europe:

**Early warning of the onset and real-time monitoring of the development of the emerging (A)H1N1 influenza pandemic in different countries in Europe.** SyS systems based on various data sources contributed to the timely surveillance of the spread of the pandemic in different countries, such as web queries on a health website in Sweden (Hulth et al., 2011) and analysed by Google Flu Trends for 13 countries (Valdivia et al. 2010), school absenteeism in the United Kingdom (Kara et al., 2012), emergency care patient records in Austria, Belgium and Spain (Rosenkötter et al., 2013), primary care patient records in the United Kingdom and Denmark (Harcourt et al., 2012, Harder et al., 2011), and telephone helpline calls in the United Kingdom (Smith et al., 2011, Kavanagh et al., 2012).

**Detection of an outbreak of the new Schmallenberg virus by cross-border cooperation.** Complementing traditional case-based animal surveillance in Germany that identified occurrences in dairy cattle, SyS detected a cluster of atypical symptoms in cattle in the Netherlands (Calavas et al., 2012, Hoffmann et al., 2012).

**Retrospective impact assessment of bluetongue virus:** a retrospective surveillance of cattle mortality in France from 2005 to 2010 highlighted the impact of bluetongue virus (Perrin et al., 2010).

SyS was the only source to provide **early warning and daily monitoring of the peak influenza season** and subsequent reallocation of emergency department resources during the Christmas holidays in Santander, Spain (2010/11). General practitioner practices were closed so the traditional influenza surveillance system based on sentinel GPs was inactive (Schrell et al., 2013).

**Early detection of communicable and non-communicable disease outbreaks. During the Olympic Games 2012,** SyS based on four data sources provided early warning of smaller communicable disease outbreaks, a rise in asthma and heat-related illness cases and real-time reassurance that no other public health threat were occurring (Elliot et al, 2013). Syndromic surveillance was also been used for the health surveillance of the Olympic Games 2004 in Athens (Dafni et al, 2004).

**Timely reassurance during an outbreak.** SyS provided real-time reassurance that a gastrointestinal outbreak in policy and security staff was not the result of a bio-terrorist attack on attendees of the G8 summit in Scotland on the day the London terrorist attacks on 7 July 2005 (Meyer et al., 2008).

**Detection and timely situational awareness:** a retrospective analysis of several of waterborne and foodborne diseases highlighted the ability of telephone triage and over-the-counter pharmacy sales to identify outbreaks (Andersson et al., 2013).

**Timely reassurance that a rare environmental event had no health impact.** SyS provided (near) real-time reassurance that the volcanic ash cloud covering Europe in April 2010 was not affecting the health of populations in the United Kingdom (Elliot et al., 2010) and regions in Austria, Germany and Spain (Rosenkötter et al. 2010).

**Monitoring of carbon monoxide poisoning** in France used both specific and syndromic surveillance to measure the extent of carbon monoxide poisoning in the population, describe its spatio-temporal dynamics, and identify occurrence circumstances as basis for targeting preventive measures at regional and national levels (InVS, 2011).

**Timely situational awareness of the impact of a major heatwave** on French population in 2006. The French SyS system was the only one enabling the surveillance of the impact of high temperatures on morbidity over time, particularly on the most vulnerable population subgroups, using the number of consultations in emergency departments (Josseran et al., 2009).

**Timely situational awareness during an industrial accident.** The number of complaints from the population was followed via data from emergency departments and general practitioners to monitor the health impact of a gas leak at the Lubrizol Company on 21 January 2013 (InVS, 2013).

**Timely reassurance that an influx of refugees from North Africa to Italy posed no threat to public health.** Ad hoc surveillance of migrants in 2011 confirmed that there was no increased risk to the health of the Italian population (Riccardo et al., 2011).

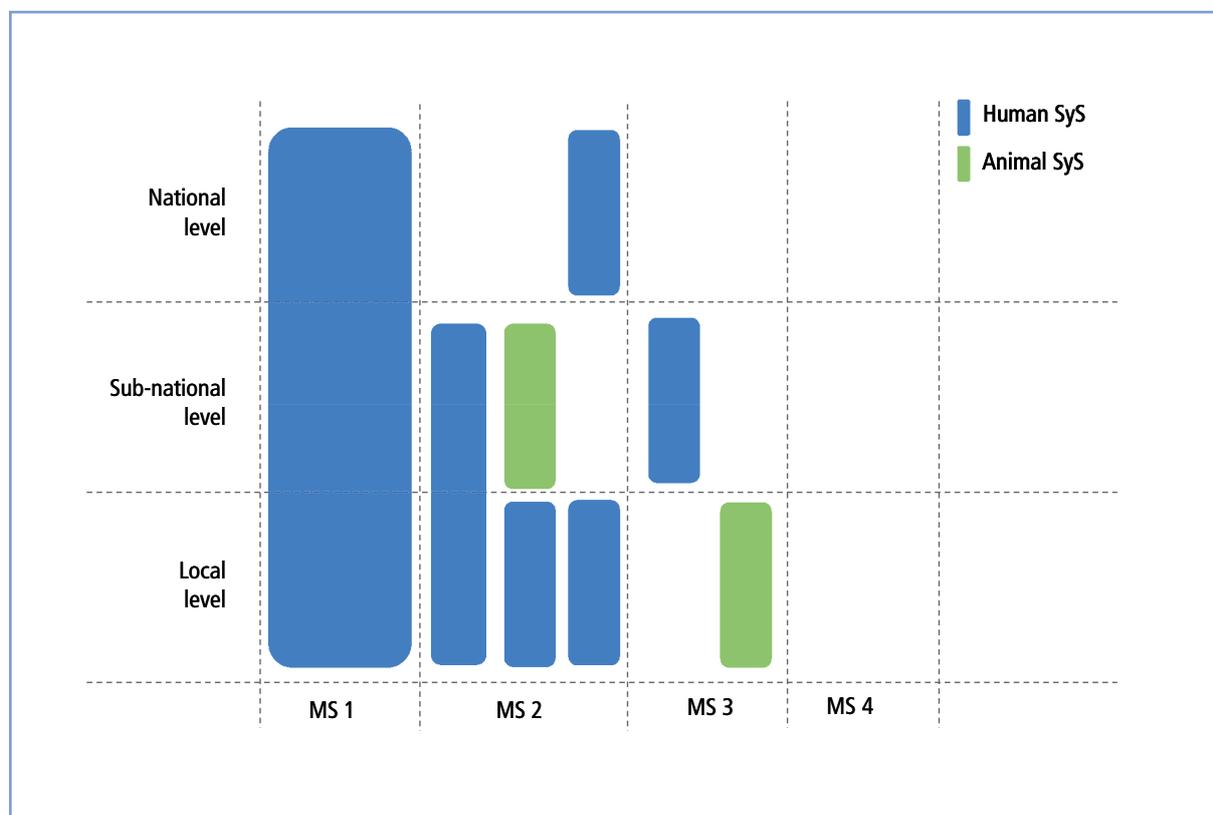
For other illustrations of the usefulness of SyS, see the Triple-S inventories of SyS systems in Europe (Conti et al., 2012; Dupuy et al, 2013), the reports on visits to SyS systems in different EU countries (Ziemann et al., 2013(a)), and the Triple-S guidelines for implementing SyS in individual countries (Medina et al., 2013).

# Proposal for integrating SyS information at Member State and European levels

## SyS organisation in Europe

SyS in Europe varies widely and uses different models of organisation in the different member states (Figure 1). Some countries' SyS systems are organised at the national level, for example UK, France, Sweden and Hungary, and can comprise animal and human SyS (MS 1). Some countries have different initiatives at the local, sub-national and national levels whose results are not centralised or linked, for example Italy, The Netherlands and Denmark (MS 2). Some countries have SyS initiatives at the local or sub-national levels and none at the national level, for example Germany, Spain and Austria (MS 3). And some countries have no SyS, for example Portugal, Luxembourg and the Czech Republic (MS 4).

Figure 1: Current organisation of SyS in Europe



### Three models for further integrating SyS in Europe

Given the diversity of SyS and its differing contexts in member states, we propose three models for further integrating SyS in Europe:

**Model 1:** Fully decentralised systems each with different data sources, syndrome definitions and non-standardised reporting. This model describes the current situation where member states already have SyS systems in place or want to create them.

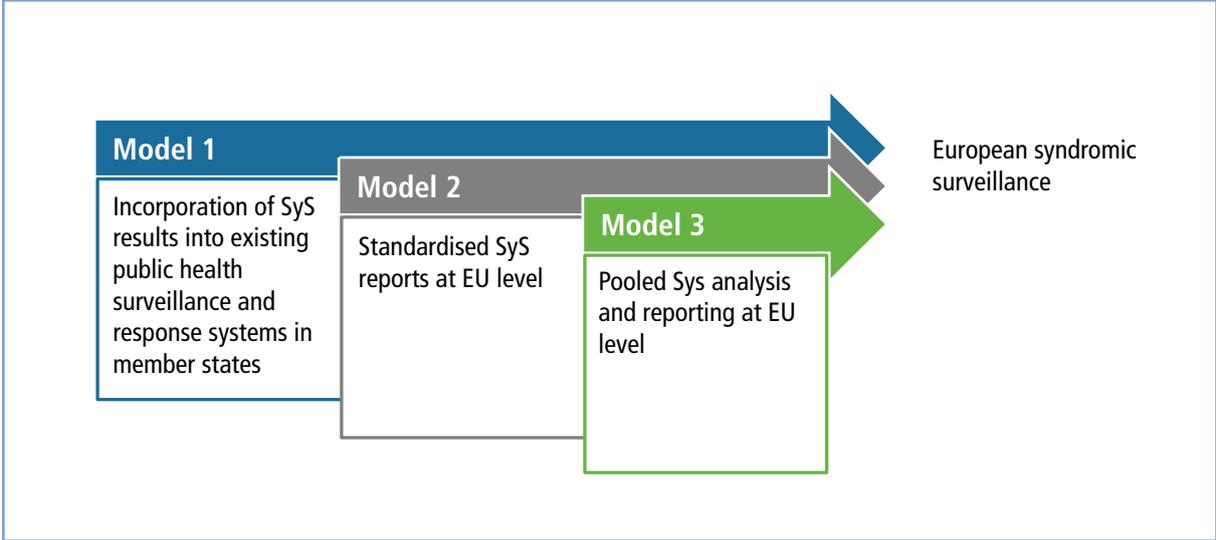
**Model 2:** Decentralised data collection but similar reporting and communication protocols across member state systems.

**Model 3:** Data collection and analysis that are fully centralised in a single European institution or location with standardised data reporting from member states.

As depicted in Figure 2, the models vary from decentralised to centralised data collection, analysis and reporting. Model 1, with non-standardised summary reports, affords the least comparability, while the detailed sharing of Model 3 gives the most.

It is important to point out that parallel implementation of the three models is proposed. Depending on the objective of surveillance and on data comparability, for some syndromes or health risks it is recommended and feasible to aim for a fully centralised model (Model 3), while for other syndromes or health risks a less integrated SyS system is more suitable.

**Figure 2: Three models of SyS comparability across Europe**



Note: Level of harmonisation and European comparability increase from left to right.

## Introduction of a SyS coordination group at the EU level

SyS is and will remain varied across member states. Whatever the integration model for SyS, it will be necessary to set up a coordination group that acts as a focal point for both individual member states and European authorities. Such a group's main tasks would be to:

- **support** member states in developing or improving SyS systems
- **act as an expert** professional group to liaise with European stakeholders having an interest in SyS
- **disseminate** the Triple-S guidelines (Medina et al., 2013, Ziemann et al., 2013(b)) to facilitate comparability of syndromic surveillance data, methods, analysis and reporting in Europe
- **disseminate** advances in information science and technology relating to public health surveillance and SyS in particular, and update the Triple-S guidelines with new developments
- **support** member states in training professionals to use SyS
- **encourage collaboration** between SyS systems and other existing surveillance systems and between animal- and human-health surveillance, especially during cross-border events
- **coordinate** comparison and interpretation of SyS intelligence across Europe
- **facilitate** feeding SyS-based findings into existing EU-level information systems
- **allow sharing** and coordination of presentation and reporting methods to facilitate mutual understanding of the types, characteristics and quality of the SyS data sources available to each member state's system
- **publish** a common lexicon and definitions, and a conceptual framework for comparing findings from different European SyS systems
- **define** how to access and use SyS data for public health purposes. In particular, address legal, policy, ethical, regulatory and practical concerns such as those related to information sharing
- **reach consensus** on an EU-wide research and development agenda for SyS, and communicate this agenda to the relevant EU bodies
- **organise meetings** and conferences within member states to promote SyS and share best practices
- **link** with international organisations working in public health surveillance (International Society for Disease Surveillance – ISDS).

The SyS coordination group would be composed of SyS experts on human and animal health. It could eventually split into an advisory group and an operational group for setting up the centralisation and interpretation of findings from member states in Models 2 and 3. The group would collaborate closely with the existing EuroMomo network.

The SyS coordination group would operate as a network of syndromic surveillance experts, fully integrated with the European public health surveillance landscape. The group would:

- advise EU member states and institutions on using and improving syndromic surveillance in accordance with the Triple-S guidelines for implementing syndromic surveillance in Europe (Model 1)
- in addition, promote comparability of findings for certain specific syndromes by providing central interpretation and dissemination of member states' SyS outputs (Model 2)
- in addition, analyse centrally collected data from member states on certain specific syndromes for comparable and timely cross-border surveillance (Model 3).

### **Model 1: Fully decentralised systems**

Model 1 does not modify the existing systems in member states. Each continues to organise its own protocol for data collection and analysis according to data availability, define its population groups and syndromes in accordance with national or local priorities, and determine its own reporting procedures, language and timing of analysis and dissemination.

SyS results are incorporated into the surveillance and reporting systems already established in member states, and each decides whether to notify existing EU-level information systems (e.g. EWRS and MediSyS). No data or report on SyS is compiled at the EU level for this model.

The SyS coordination group would mainly support the setup and improvement of SyS systems in individual member states using the Triple-S guidelines, and provide advice on SyS to EU institutions.

The strengths, drawbacks and minimum requirements for Model 1 are outlined in Table 1.

**Table 1: Model 1 – Fully decentralised SyS systems**

Model 1	Member State level (national, regional and local)	European public health level
Strengths	<p>Improves preparedness for various kinds of events</p> <p>Improves ability to meet requirements of IHR</p> <p>No change in organisation of existing SyS</p> <p>No additional work requested</p> <p>Has total control over analysing and reporting its SyS findings</p>	<p>Improves preparedness for meeting IHR 2005</p> <p>Facilitates timely exchange between member states for cross-border health threats</p> <p>Encourages scientific collaboration between member states</p>
Drawbacks	<p>Limited exchange with other member states' experts in SyS on methods, definitions, uncertainties, etc.</p>	<p>Limited comparability of findings: diversity of syndrome definitions and/or choice of indicators can bias comparative assessment of a health situation in different countries, impeding cross-border surveillance</p>
Operational implications/ minimum requirements	<p>Setup/development of SyS according to European standards and good practices (Triple-S guidelines)</p> <p>Incorporation of SyS findings into established surveillance and reporting systems</p> <p>Communication of SyS findings to EU level via established reporting mechanisms (e.g. EWRS)</p>	<p><b>Implications for SyS coordination group</b></p> <p>Advise member states and EU institutions</p>

## Model 2: Decentralised data collection with standardised reporting

In this model, no data is sent to the EU level and each member state analyses and interprets its own findings. The reporting and communication of findings is standardised. This facilitates comparison of findings from different countries allowing a rapid, synthetic view of the situations in individual and adjacent member states, and at the EU level. This approach would enable member state and EU institutions to act sooner and identify earlier events that need European coordination.

This model would require a minimum degree of agreement to:

- define standards for reporting findings based on SyS information
- define a minimum level of metadata reporting (e.g. statistical criteria for determining signals and indicators for measuring variations in data) to allow interpretation of various SyS outputs and increase comparability.

To enable interpretation at the European level of reports from national, regional and local SyS, there would be a need for each member state to provide a complete description of the epidemiological indicators and, to help explain fluctuations in these indicators, an assessment of the health situation (e.g. local climate variations or events, epidemics, adverse effects of new releases). There would also be a need to share metadata on SyS systems (e.g. description of data sources) and discuss both the methods used to analyse data and the limitations and biases of findings.

The reports compiled by the SyS coordination group would be fed into existing EU-level information systems (e.g. MediSyS and EWRS).

The strengths, drawbacks and minimum requirements for Model 2 are outlined in Table 2.

**Table 2: Model 2 – Decentralised data collection with standardised reporting and communication**

Model	Member State level (national, regional and local)	European public health level
Strengths	<p>Total control over analysing and communicating its SyS findings</p> <p>Common set of findings for comparison</p> <p>Can contribute to common thinking on the standardisation of definitions and methods</p>	<p>Minimum set of comparable SyS findings facilitates comprehensive awareness and tracking of health events for guidance in making decisions requiring early action</p> <p>Mechanism for routine collection of a minimum amount of standardised information from member states enables quick action during an emerging or emergency situation</p> <p>Encourages easier scientific collaboration and exchanges when cross-border events occur</p> <p>Links between member state experts and EU institutions, such as the ECDC, would enrich specific routine surveillance and EU-wide threat assessments</p> <p>May highlight differences in definitions and analytical models and so serve as a first step towards a more coordinated approach to SyS</p>
Drawbacks	<p>Will require some changes in the internal organisation of its current SyS</p> <p>Will need additional work to report findings in an agreed format for</p> <p>May limit participation if not all data providers can conform to agreed standards</p>	<p>Requires prior work by the SyS coordination group to define a standard template for member states to present results at the European level.</p> <p>Full agreement between member states and the SyS coordination group would probably be hard to achieve</p>
Operational implications/ minimum requirements	<p>Define minimum standardised actions needed to produce comparable results</p> <p>Establish automated operating procedures to ensure continuity when sharing outputs and interpretation with the SyS coordination group</p> <p>Agree on data protection and confidentiality</p>	<p><b>Implications for SyS coordination group</b></p> <p>Define respective roles of member states and the SyS coordination group</p> <p>Determine and define what needs to be standardised</p> <p>Establish operating procedures to ensure continuous EU-level synthesis on a routine basis and during crises and holidays, includes different pools of dedicated experts and back-up plans</p> <p>Funding required for operation of the SyS coordination group</p>

### Model 3: Fully centralised system

The data collected from member states would comply with a common protocol defining the format of the data, the groups for data aggregation, common definitions of syndromes, geographical levels, etc.

Centralisation of the data permits analysis of trends and patterns as well as assessment of the impact of events at the European level. This would facilitate region-wide situational awareness, early detection of events and coordination of early action. The same tools for analysing data could be used by individual member states to ensure better harmonisation of local, regional and national communication and at the European level.

This centralised model for data analysis could be more sensitive and thus identify events that have a small but sustained impact on the selected indicators or affect specific population subgroups.

The EuroMomo (European project for Monitoring mortality in Europe) project has used this model to monitor all-cause mortality at the European level by centralising aggregated data on a weekly basis for five age groups. The EuroMomo experience shows that it is meaningful and possible to aim towards a common model for the analysis, interpretation and dissemination of results from pooled analyses.

On the other hand, it is also important to stress that SyS would be more complex due to the wide variety of data sources from contributing systems. Furthermore, the types of indicators and outcomes for SyS are more numerous and diverse than for EuroMomo. Therefore, SyS would require additional work to identify the most relevant indicators for such a high level of coordination.

In this fully centralised model, the variety of data sources, indicators, etc. would require close collaboration between the SyS coordination group and experts from member states to determine common definitions, methods and tools for analysis. It is important to keep in mind that, in this model, centralised analysis and interpretation are not a substitute for local analysis and interpretation, which will always be needed. EuroMomo also applies this principle.

Also in this model, the comparative analyses performed by the SyS coordination group are fed into the existing EU-level information systems (e.g. MediSyS and EWRS).

The strengths, drawbacks and minimum requirements for Model 3 are outlined in Table 3.

**Table 3: Model 3 – Centralised data collection and analysis**

Model	Member State level (national, regional and local)	European public health level
Strengths	<p>Common standardised protocols and tools for analysing data, providing fully comparable results</p> <p>Knowledge of the public health situation for certain health risks or syndromes at EU level or in other member states</p> <p>Total control of data reporting increasing cost-effectiveness and timeliness of reports</p>	<p>Centralised interpretation at the EU level on the health impacts of an event through fully harmonised reporting of findings</p> <p>Rapid, comparable cross-border surveillance of an event</p> <p>Comparisons of patterns and trends facilitated by centralised data analysis using common methodology and epidemiological indicators</p> <p>Stronger links with EU institutions would enrich routine specific surveillance as well as EU-wide threat assessment</p>
Drawbacks	<p>Will require considerable work by SyS experts to agree on and implement a common standardised protocol for data collection, aggregation and analysis, methods and tools, and reporting of syndromes.</p> <p>May reduce timeliness unless member states also analyse data; same priority applies as in Model 2 (member state should not wait for a joint analysis, but analyses should complement each other)</p>	<p>Full agreement between member states and the SyS coordination group on common definitions, data sources, data coding and analysis difficult to reach given the heterogeneity of sources for morbidity data (web searches, reasons for calls to helplines, visits to general practitioners, prescriptions, diagnoses by hospital emergency services and emergency medical calls)</p> <p>Would require extensive work and resources at both the member state and EU levels to centralise, manage and analyse data and reporting</p>
Operational implications/ minimum requirements	<p>Compliance with a European common standardised protocol.</p> <p>Automated reporting of data to the SyS coordination group to reduce the work load</p> <p>Agreement with the SyS coordination group on data protection and confidentiality</p>	<p><b>Implications for SyS coordination group</b></p> <p>Relatively costly infrastructure and human resources needed to centralise, analyse and store data securely and to manage and monitor such a large database</p> <p>Agreement with each member state on data protection and confidentiality</p> <p>Define respective roles of contributors to the SyS coordination group and member states</p> <p>Work to define the standardised protocol</p> <p>Establish procedures to ensure continuous operation on a routine basis and during crises</p> <p>Far more funds needed to operate a fully centralised system</p>

**Summary of responsibilities**

Table 4 summarises the responsibilities of member states and the SyS coordination group for each of the three models.

**Table 4: Responsibilities of member states and the SyS coordination group (SCG)**

	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>
Data source and type	Determined by member state	Determined by member state	Determined by member state using EU common standards
Populations, syndromes and indicators	Determined by member state	Determined by member state	Determined by SCG
Analytical methods	Determined by member state	Determined by member state	Determined by SCG
Reporting to SyS coordination group/ EU level	Determined by member state	Determined by member state using EU common standards	Determined by SCG
EU comparison of SyS outputs	Not applicable	Determined by SCG	Determined by SCG
EU reporting within Europe and back to member states	Not applicable	Determined by SCG	Determined by SCG

# Integration of SyS in the landscape of European public health surveillance

## Syndromic surveillance stakeholders in Europe

No single institution in Europe coordinates cross-border surveillance and response to animal- and human-health threats of a communicable or non-communicable nature.

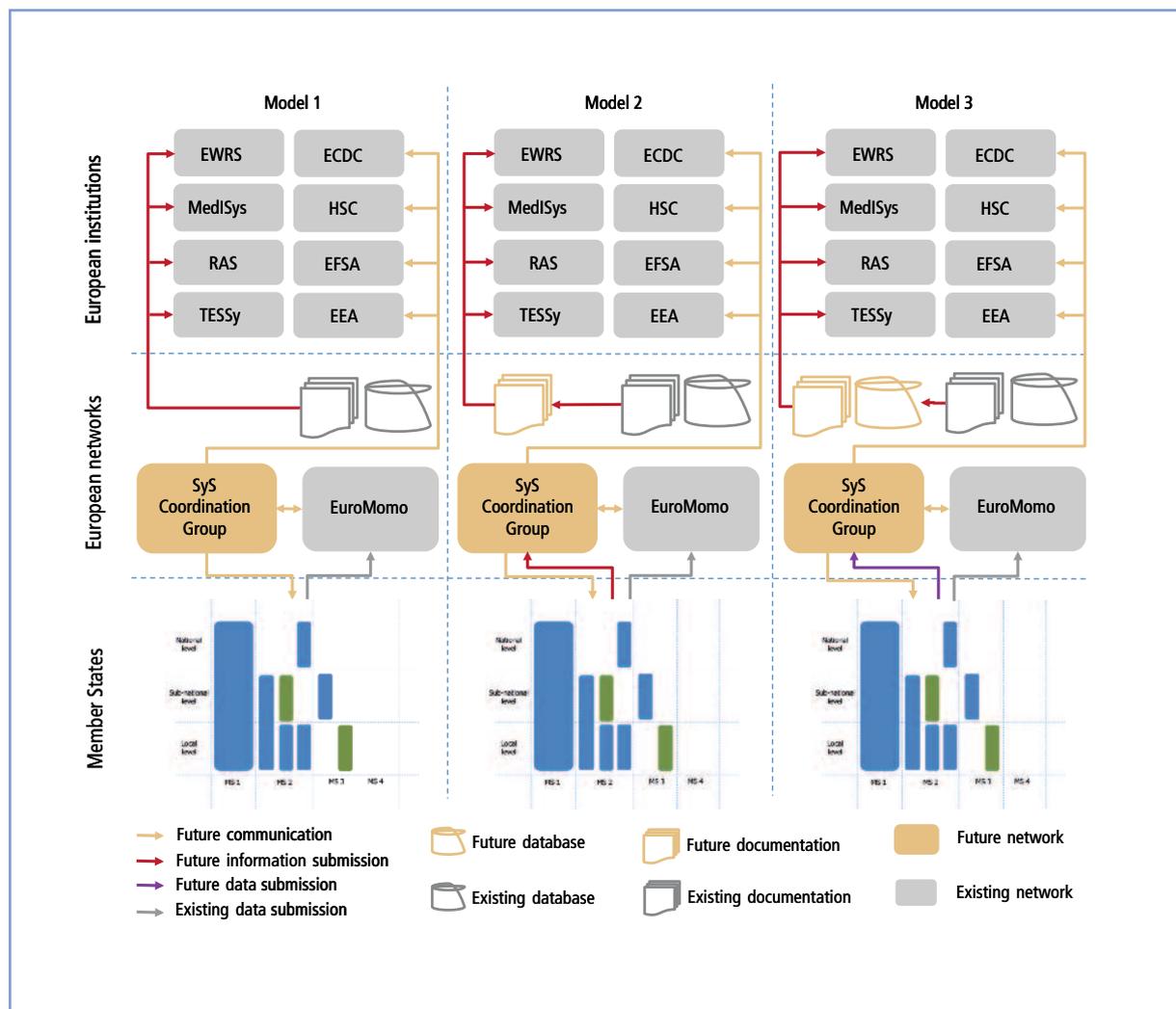
Currently, three main types of players are active in public health surveillance:

- Member states, including players at local, regional and national levels (data providers, public health authorities, health care providers, policy makers, etc.)
- European bodies (e.g. ECDC, EFSA and EEA) and international organisations (e.g. WHO, OIE and ISDS)
- European public health surveillance networks and health information systems (e.g. EuroMomo, EWRS and MedISys).

To ensure sustainability of each proposed model, a fourth player is needed, in the form of the proposed SyS coordination group, to coordinate SyS activities in Europe.

Figure 3 illustrates SyS integration in the European public health surveillance landscape.

**Figure 3: Main groups of SyS stakeholders in Europe and links between them in the three models**



ECDC: European Centre for Disease Prevention and Control

EEA: European Environment Agency

EFSA: European Food Safety Authority

EWRS: Early Warning and Response System

HSC: Health Security Committee

MedISys: Medical Information System

RAS: Rapid Alert System

TESSy: The European Surveillance System

- Model 1 – the SyS coordination group advises member states and European institutions on questions of SyS and supports implementation and improvement of SyS in member states according to the Triple-S guidelines. In this model, EuroMomo feeds its information into the existing information and early warning systems at the EU level.
- Model 2 – the SyS coordination group, in addition to advising member states and EU institutions, receives standardised information from individual member states which is compiled together with information from EuroMomo and fed into the existing information and early warning systems at EU level.
- Model 3 – the SyS coordination group receives standardised SyS data from member states that are analysed and compiled together with information from EuroMomo and fed into the existing EU-level information and early warning systems. Also, as in the other models, the SyS coordination group gives advice on SyS to member states and EU institutions.

## SyS stakeholders: their roles and benefits

### The SyS coordination group: roles

To summarise the description in the previous section, the SyS coordination group would:

- **provide advice** to member states on setting up and/or improving their SyS systems (using the Triple-S guidelines) and provide advice to EU institutions on SyS (principle of Model 1)
- **develop standards** for reporting SyS results from member states to the EU level (principle of Model 2)
- **analyse, interpret and report** standardised SyS results from member states at the EU level (principle of Model 3)
- **facilitate reporting** of SyS results to EU-level information systems (Models 2 and 3).

### The SyS coordination group: benefits

Benefits of the SyS coordination group would include enabling sustainable integration of SyS results into EU public health surveillance.

### Member state: roles

In Model 1, member states would operate their own SyS systems, including data collection and management, data analysis, and reporting of findings and their epidemiological interpretation.

In Models 2 and 3, member states would operate their own SyS systems, but data analysis or/and reporting would be centralised. In these models, member states would also provide local context and knowledge of their systems.

In Models 2 and 3, member states are expected to designate a contact point for each system to provide the SyS coordination group with the information (detailed below for each model) needed to understand the local context and to enable correct interpretation of the member states' findings.

### Member state: benefits

The benefits for member states depend on the model: from networking with other SyS systems in Model 1 to contributing to common definitions and methods in Model 2, and then to the power of EU-wide understanding of an event to support national decision-making in Model 3. Currently many national SyS systems complement specific systems within these countries and have shown their added value for public health surveillance.

### **European Union institutions: roles**

Roles of EU institutions would include:

- supporting incorporation of SyS-based findings into existing EU-level information systems (e.g. EWRS)
- enabling direct connection with EU decision-makers on surveillance and alerts
- linking with international organisations (e.g. WHO, OIE)
- supporting knowledge transfer on SyS surveillance and raising awareness among institutions' own stakeholders
- supporting the setting-up and sustainability of the SyS coordination group.

### **European Union institutions: benefits**

The European institutions would get better informed and more timely views of public health situations at the EU and international levels to support decision-making and preventive actions.

### **European public health surveillance networks and health information systems: roles**

The role of these networks and information systems would integrate SyS information from member states or the SyS coordination group into existing health information systems.

### **European public health surveillance networks and health information systems: benefits**

These networks and information systems would complement information from SyS data sources.

# Conclusion

To ensure the successful creation and sustainability of a European strategy for syndromic surveillance, the role, shape and functioning of a SyS coordination group need to be defined in partnership with the relevant stakeholders at the EU level.

The purpose of this collaborative approach is to achieve the best possible integration and cooperation with these parties, and make the strategy as actionable, useful and cost-effective as possible.

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