



**EU VAC.NET**

A surveillance Community Network for Vaccine Preventable Infectious Diseases



STATENS  
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NATIONAL CENTRE FOR EPIDEMIOLOGY  
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## Work Package 8 Final Report

# Sentinel Systems for the Surveillance of Vaccine-Preventable Diseases in Europe

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## List of Abbreviations

CR	Congenital rubella
DH	Department of Health
ECDC	European Centre for Disease Prevention and Control
GP	General Practitioner
HCDCP	Hellenic Centre for Disease Control and Prevention
HPA	Health Protection Agency
HPSC	Health Protection Surveillance Centre
InVS	Institut de Veille Sanitaire
INSA	Instituto Nacional de Saúde Dr. Ricardo Jorge
INSERM	Institut National de la Santé e de la Recherche Médicale
ISS	Istituto Superiore di Sanità
MOH	Ministry of Health
NSCK	Netherlands Paediatric Surveillance Unit
PC	Primary care
RIVM	Netherlands National Institute for Public Health and the Environment
RKI	Robert Koch Institute
SFOPH	Swiss Federal Office of Public Health
VPD	Vaccine-preventable diseases
VZV	Varicella zoster virus
WP8	Work-package 8

## Background

Epidemiological surveillance is defined as the “ongoing systematic collection, analysis and interpretation of data and the timely dissemination of these data to those who need to know in order that an action can be taken” (1).

Sentinel surveillance systems rely on a pre-arranged sample of reporting sources (e.g. emergency departments, hospitals, general practitioners) who agree to report all cases of selected conditions. They are potentially an important source of public health information and can provide timely information on vaccine-preventable diseases (VPD) that is not available from other sources. Indeed, in some countries such systems may be the only source of information. In addition, it is a well known fact that many statutory notifiable diseases are under-reported and not all information required is routinely available. Sentinel systems can therefore supplement the information collected routinely by more comprehensive surveillance systems, for example, by collecting data on disease complications and hospitalisations.

Although information is generally not available for the entire population, sentinel systems can provide sufficient information for making public health decisions and for detecting long-term trends. Being generally less costly than universal surveillance systems they are particularly useful for diseases that occur frequently. Also, they provide value to countries beyond the data collected, by building partnerships between participating sites and increasing awareness of occurrence of VPD.

Networks of sentinel physicians already operate in many European countries (2). For example, physician sentinels are often used for surveillance of influenza-like illness (3, 4) and some countries use hospitals to collect more in-depth information on particular diseases (e.g. pertussis) than can be obtained through routine surveillance. They also provide additional information on the epidemiology and burden of disease (e.g. age-specific case-fatality rates).

In 2000, a survey conducted by EUVAC.NET showed that sentinel surveillance systems for either measles or pertussis were in place in three participating countries (5). In 2006, ECDC conducted a survey of existing surveillance systems for infectious diseases in Europe (6). Out of a total of 279 surveillance systems, 54 were based on sentinel networks. Thirteen of the latter included the surveillance of VPD. So far, however, a detailed description of sentinel surveillance systems for VPD in Europe has not been conducted. The objectives of EUVAC.NET Work Package 8 (WP8) were therefore:

- a) to create an inventory of sentinel physician/paediatrician networks in Member States
- b) to identify strengths and weaknesses in surveillance systems for VPD, and
- c) to create a network of competent sources of reliable data on various VPD in each Member State.

This report describes the results of a survey performed by WP8 to describe and create an inventory of sentinel physician/paediatrician networks for selected VPD, i.e. measles, mumps, rubella, congenital rubella, pertussis, and varicella, in participating countries.

## Methods

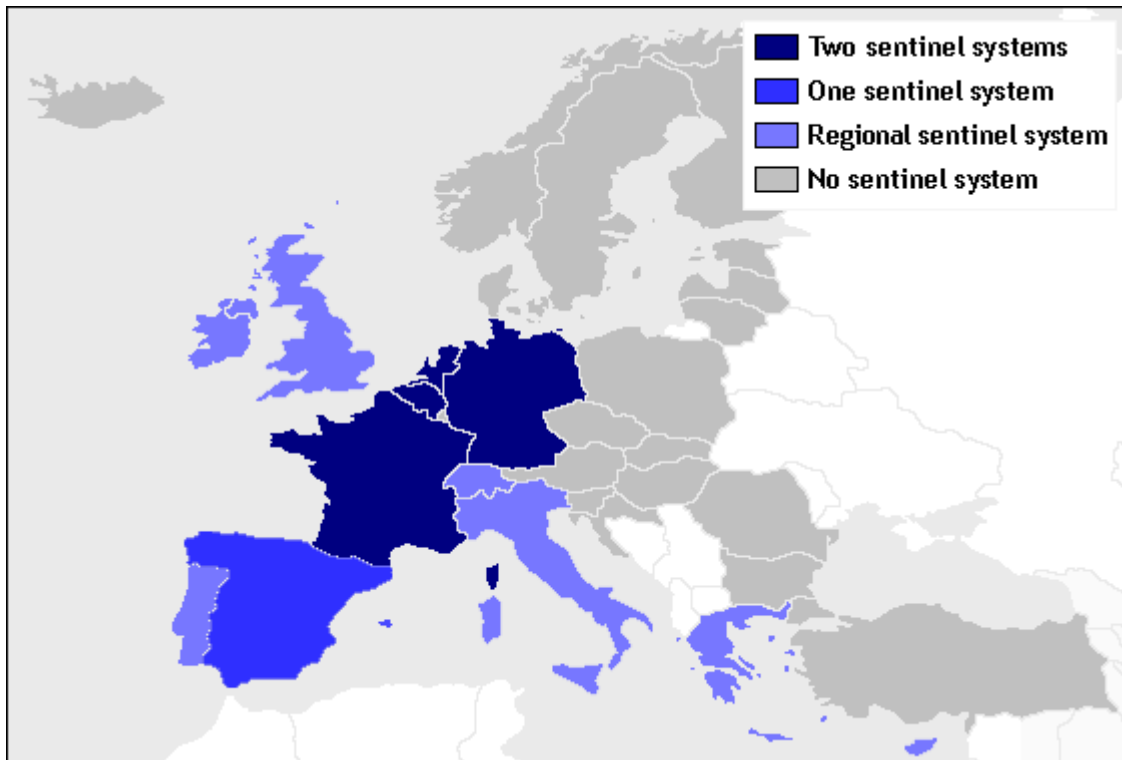
In October 2006, an electronic questionnaire was sent to the EUVAC.NET national gatekeepers of all 32 participating countries. These include all 27 European Member States, Croatia, Iceland, Norway, Switzerland and Turkey. The questionnaire included questions on general characteristics of sentinel systems, sources of data, choice of denominator, case definitions used, flow, collection, analysis and dissemination of data, and system monitoring. Compliance of participants was also investigated. In the questionnaire, the latter was defined as the proportion of physicians which reported in the year 2005, compared with the number of physicians who should have reported. Only VPD included in EUVAC.NET were considered (i.e. measles, mumps, rubella, congenital rubella, pertussis, and varicella). A reminder was sent by electronic mail to all non-responders in March 2007. Data was updated to August 2007.

## Results

### *Number of sentinel systems*

All 32 EUVAC.NET countries participated in the survey. Most countries (20/32; 62%) did not have a sentinel surveillance system in place for VPD, seven (22%) had one system in place (Cyprus, Greece, Ireland, Italy, Portugal, Switzerland, UK), four (13%) had two systems (Belgium, France, Germany, Netherlands), while one country (3%) (Spain) had a regional system (Figure 1). The latter was not included in the analysis. In total, therefore, 15 national sentinel systems for VPD, in 11 European countries, were included in the analysis. A complete description of each sentinel system is included in Appendix 1.

**Figure 1.** Sentinel surveillance systems for vaccine-preventable diseases in EUVAC.NET participating countries, 2007



### ***Objectives of existing sentinel systems***

The most frequently stated objective of existing sentinel systems was to undertake epidemiological surveillance of VPD, and in detail, to monitor trends and measure disease burden. Other stated objectives included the collection of clinical information (e.g. data on complications) and the evaluation of the impact of vaccination programmes. In the Netherlands, one objective of the sentinel system for varicella was to assess the health-care costs for cases hospitalized with severe varicella zoster.

### ***Year established, number and type of sites involved, type of participation, payment and source of funding***

The oldest existing sentinel system was established in the UK in 1967 (Table 1). Six systems were established from 2000 onwards.

Most (12/15) existing sentinel systems were based on primary care physicians (general practitioners and paediatricians). Two systems were hospital-based: sentinel surveillance of pertussis in France (Renacoq) and of varicella in the Netherlands (Pedianet). In one system (Cyprus), both primary care physicians and hospitals were involved.

In 14/15 systems the participation of physicians was on a voluntary basis. Payment for participation was carried out for two such systems as well as in the only system which ran on a mandatory basis. Participating physicians/sites

were recruited in various ways, mainly through direct contact, letters of invitation, announcements in medical journals or at meetings and symposia. In systems based on primary care physicians, the median number of participants was 199 (range 57-1270), while the three systems involving hospitals included 19, 43 and 75 sites respectively.

In most systems (13/15), participation was regularly monitored and the median compliance in 2005 was 73%. In 11 systems, systematic reminder operations (letter, fax, telephone) were activated if participation by a sentinel practitioner was low.

All identified systems were, at least to some degree, government-funded, obtaining funds from the Ministry/Department of Health, National Health Institute, or research/surveillance centres. Two systems were partly privately funded.

**Table 1.** Sentinel surveillance systems for vaccine-preventable diseases covered by EUVAC.NET (measles, mumps, congenital rubella, rubella, pertussis, varicella) in participating countries, 2007

Country (Name of sentinel system/ disease under surveillance) <i>Year established</i>	Site of sentinel system		Type of Participation	Compliance	Payment	Funding
	PC (n)	Hospital (n)				
Belgium (Pedisurv) 2002	Yes (n=889)		Voluntary	65%	No	MOH, Flemish and French communities
Belgium (GP) 1979*	Yes (n=150)		Voluntary	95%	Yes	Flemish and French communities
Cyprus 2003	Yes (n=57)	Yes (n=19)	Voluntary	60%	No	MOH
France (Sentiweb) 1984	Yes (n=1270)		Voluntary	21%	No	InVS, INSERM
France (Renacoq) 1996		Yes (n=43)	Voluntary	90%	No	InVS
Germany (measles) 1999	Yes (n=1100)		Voluntary	80%	No	Public-private partnership between RKI + 2 vaccine manufacturers
Germany (varicella) 2005	Yes (n=1000)		Voluntary	70%	No	as above
Greece 1999	Yes (n=282)		Voluntary	~ 60%	No	HCDCP
Ireland 2000	Yes (n=96)		Mandatory	93.5%	Yes	HPSC
Italy (SPES) 2000	Yes (n=324)		Voluntary	73%	No	ISS, 3 paediatric associations
The Netherlands (Nivel) 1970**	Yes (n=60)		Voluntary	unknown	No	Ministry of Public Health Welfare and Sport
The Netherlands (Pedianet) 2006***		Yes (n=75)	Voluntary	85%	No	RIVM , NSCK
Portugal 1989	Yes (n=147)		Voluntary	unknown	No	INSA
Switzerland (Sentinella) 1986	Yes (n=199)		Voluntary	89% reported weekly for at least 75% of weeks	No	SFOPH
UK 1967	Yes (n=100)		Voluntary	75% reported weekly; 90% reported at least 40/52 weeks	Yes	DH, HPA

**Legend:** PC=Primary Care; MOH=Ministry of Health; InVS= Institut de Veille Sanitaire; INSERM= Institut National de la Santé e de la Recherche Médicale; RKI= Robert Koch Institute; HCDCP= Hellenic Centre for Disease Control and Prevention; HPSC=Health Protection Surveillance Centre; INSA= "Instituto Nacional de Saúde Dr. Ricardo Jorge" MoH; ISS = Istituto Superiore di Sanità; RIVM= Netherlands National Institute for Public Health and the Environment; NSCK= Netherlands Paediatric Surveillance Unit; SFOPH= Swiss Federal Office of Public Health; DH= Department of Health; HPA=Health Protection Agency

\* varicella and zoster included in 2006 \*\* pertussis included in 1998, varicella in 2000

\*\*\* this sentinel system was in place from 1 July 2006 to 1 July 2007 only



## ***Diseases under surveillance***

Most systems (12/15) collected data on more than one VPD (Table 2). Varicella was the disease most frequently under surveillance and was included in 11 systems. Nine systems collected data on measles, eight on mumps, eight on pertussis, five on rubella, and two on congenital rubella. Varicella zoster was under surveillance by six sentinel systems. In addition to the VPD included in EUVAC.NET, most of the sentinel systems also covered other diseases (i.e. other infectious diseases - including other VPD such as hepatitis A and B -, and chronic diseases); these however were not considered for the purposes of this survey.

The reporting of cases through sentinel networks was mainly based on clinical criteria. Case definitions of all diseases under surveillance were provided to participating physicians in 13/15 systems, while in 2/15 these were provided for at least some of the diseases covered by the surveillance system.

In 3/15 systems laboratory confirmation was required for reporting of at least some of the diseases under surveillance. In all cases where laboratory confirmation was required, laboratory criteria were provided to participating physicians.

**Table 2.** Diseases under surveillance by sentinel systems, availability of case definitions and laboratory confirmation requirements in EUVAC.NET participating countries, 2007

Sentinel system	Diseases under surveillance							Case definition	Laboratory confirmation
	Measles	Mumps	Rubella	Pertussis	CR	Varicella	Zoster		
Belgium (Pedisurv)	x	x			x			Yes	No
Belgium (GP)						x	x	Yes	No
Cyprus	x	x	x	x		x		Yes	No
France (Sentiweb)	x	x				x	x	Yes	No
France (Renacoq)				x				Yes	Yes
Germany (Measles)	x							Yes	No
Germany (Varicella)						x	x	Yes	No
Greece	x	x	x	x		x		Yes	No
Ireland	x	x		x		x	x	All except varicella + zoster	Measles
Italy (SPES)	x	x	x	x	x	x		Yes	CR
The Netherlands (Nivel)				x		x		Yes	No
The Netherlands (Pedianet)*						x	x	Yes	No
Portugal						x		Yes	No
Switzerland (Sentinella)	x	x	x	x				Yes	No
UK	x	x	x	x		x	x	Varicella only	No

Legend: CR=congenital rubella. \* In place from 1 July 2006 to 1 July 2007.

In most (7/11) countries, the diseases under surveillance by sentinel systems were also covered by other national surveillance systems (e.g. mandatory reporting). However, seven countries had no alternative source of data for some or all of the diseases under surveillance by the sentinel system(s). In detail, sentinel systems were the only source of data for mumps, CR, and varicella in Belgium, mumps, pertussis, and varicella in France, mumps and pertussis in Switzerland, and varicella in Ireland, the Netherlands, Portugal and the UK. At the time of the survey, in Switzerland, the sentinel system was also the only source of data regarding postnatal rubella not occurring during pregnancy (included in the mandatory reporting system in January 2008). Rubella during pregnancy and rubella infection at birth however were already statutory notifiable.

***Type and percentage of population under surveillance and type of denominator used***

In 12 systems, the population under surveillance included all age-groups, while in three systems it included only children aged below 6 months, 15 years and 16 years respectively (Table 3). Information regarding the percentage of the population monitored was available for eight systems only; this percentage ranged from 0.4% to 4.3%. The choice of denominator in each country was mostly related to the manner in which health-care was organized. In three countries (Italy, Portugal, UK), there were fixed lists of patients registered with each general practitioner/primary health-care physician, and characteristics of the denominator population were therefore available. For the remaining systems, the denominator was calculated by using census data, number of consultations or number of sentinel practices.

**Table 3.** Type and percentage of population under surveillance and type of denominator used by sentinel surveillance systems for VPD in EUVAC.NET participating countries, 2007

Sentinel system	Population under surveillance	% population under surveillance	Denominator
Belgium (Pedisurv)	General population	NA	NA
Belgium (GPs)	General population	1.76%	No. of consultations
Cyprus	General population	NA	No. of consultations
France (Sentiweb)	General population	0.42%	National/regional census data
France (Renacoq)	Children < 6 months	NA (30% of paediatric hospital admissions)	National census data (children < 3 months for incidence rates)
Germany (measles)	General population	NA	No. of sentinel practices
Germany (varicella)	General population	NA	No. of sentinel practices, N. consultations
Greece	General population	NA	No. of consultations
Ireland	General population	4.3%	Census data
Italy (SPES)	Children < 15 years	2.5%	No. of patients registered
The Netherlands (Nivel)	General population	1%	No. of sentinel practices, Population in age category
The Netherlands (Pedianet)*	Children < 16 years	NA	Population in age category
Portugal	General population	2%	No. of patients registered
Switzerland (Sentinella)	General population	3%	No. of consultations
UK	General population	1-2%	No. of patients registered

NA= not available. \* in place from 1 July 2006 to 1 July 2007

### ***Variables collected***

Although all systems collected data on the age of cases and 14/15 systems (all except Nivel, The Netherlands) collected data regarding the date of onset of disease or the date of consultation, it should be noted that the specific information collected regarding these variables differed between systems (Table 4). As far as age was concerned, nine systems collected the date of birth while three systems collected only the age of cases in years/months and three systems (Cyprus, Germany for varicella, and UK) collected information on age-groups of cases. Regarding the disease onset dates, 10 systems collected data on the date of onset of symptoms, three systems (Greece, Ireland, and UK) registered only the date or week of consultation, one system (Cyprus) only the week of reporting, and one system did not collect this information. Information on gender was collected by 14 systems, vaccination status by 11, disease complications and mortality data by eight (Table 4).

**Table 4.** Variables collected by sentinel surveillance systems for VPD, in EUVAC.NET participating countries, 2007

Sentinel system	Sex	DOB	Age	Onset date	Date consultation	Vaccination status	Complications	Death	Other
Belgium (Pedisurv)	x	x		x		x	x	x	Clinical features, laboratory data, sources of infection (measles mumps)
Belgium (GP sentinel network)	x	x		x		x	x	x	
Cyprus			A-G		(week of reporting)				
France (Sentiweb)	x		x	x	x	x	x		Disease specific
France (Renacoq)	x	x		x	x	x		x	Possible sources of infection
Germany measles	x	x		x	x	x	x	x	Reasons for non-vaccination, date of laboratory confirmation, hospitalisation, source of infection
Germany varicella	x		A-G	x	x	x	x	x	No. of patient contacts per week/month, No. of vaccinations per month
Greece	x		x		(week )	x			
Ireland	x	x			x	x			
Italy (SPES)	x	x		x		x	x	x	Municipality of practice, lab for CR, vaccination details
The Netherlands (Nivel)	x	x				x			Type of lab confirmation
The Netherlands (Pedianet)*	x	x		x	x		x	x	
Portugal	x		x	x	(week)			x	Disease specific
Switzerland (Sentinella)	x	x		x	(week)	x	x		Clinical features, vaccination details, lab results, epi-link, other cases in the surroundings, hospitalisation, municipality of practice
UK	x		A-G		x				

Legend: DOB=date of birth, A-G= Age-group. \* in place from 1 July 2006 to 1 July 2007

### ***Frequency of data collection, analysis and dissemination***

Data was collected on a weekly basis in 8/15 systems, monthly in 5/15 systems, and quarterly in one system (Table 5). In one system (France Sentiweb), it was collected continuously through the web. In one of the systems where data was collected on a weekly basis (Switzerland), this was true for most physicians although approximately one third of physicians reported continuously through the web...

Data was reported to national health agencies in 7/15 systems or to other institutions (including research centres) in 8/15 systems; this was done by regular mail (8/15), electronic mail (7/15), fax (6/15), through the web (6/15), or by telephone (1/15).

Data was analysed at variable frequencies and was disseminated mainly to participating practitioners/sites (14 systems), Ministry of Health (nine systems) and professional organizations (seven systems). This was done at varying frequencies ranging from weekly to yearly and mainly via mail/fax/electronic mail, bulletins or through the system's website. Thirteen systems operate a website (all countries except Cyprus and Greece).

**Table 5.** Frequency of data reporting/analysis/dissemination in sentinel systems for VPD, in EUVAC.NET participating countries, 2007

<b>Sentinel system (Name)</b>	<b>Data collection</b>	<b>Data analysis</b>	<b>Data dissemination</b>
Belgium (Pedisurv)	Monthly	3 months	3 months
Belgium (GP sentinel network)	Weekly	Yearly	Yearly
Cyprus	Weekly	Weekly	6 months
France Sentiweb	Continuously by web	Weekly	Weekly
France Renacoq	Quarterly	Quarterly	Quarterly
Germany measles	Monthly	Monthly	Monthly (website)
Germany varicella	Monthly	Monthly	Monthly
Greece	Weekly	Weekly	Weekly
Ireland	Weekly	Monthly	Monthly
Italy SPES	Monthly	Monthly	Monthly (website)
Netherlands Nivel	Weekly	Yearly	Yearly
Netherlands Pedianet*	Monthly	Yearly	Yearly
Portugal	Weekly	Yearly	Yearly
Switzerland	Weekly. Approx. 1/3 of physicians report continuously by web	Weekly	Weekly
UK	Weekly	Weekly	Weekly

\*in place from 1 July 2006 to 1 July 2007

Cost evaluations have been performed by two systems (Portugal and UK).

## Conclusions

This inventory shows that over one third of European countries have implemented sentinel systems for surveillance of VPD, and it describes in detail the characteristics of these systems.

Sentinel systems are based on a population sample, and their reliability in monitoring a disease decreases with decreasing disease incidence. It is therefore reassuring that all countries that have implemented sentinel systems for measles and rubella, two diseases that are targeted for elimination by 2010, also have other surveillance systems in place to cover these diseases.

On the other hand, most of the sentinel systems in Europe focused on varicella, which is still a frequent disease. Safe and effective vaccines against varicella zoster virus (VZV) are currently available in Europe but so far, Germany is the only European country that has incorporated VZV vaccination into its routine childhood immunisation programme (7-8). Many European countries, however, at the time of this survey, were evaluating whether to adopt vaccination programmes against this disease, and which population and age-group should be targeted (9). In these countries, sentinel surveillance data can be useful for obtaining a baseline estimate of varicella and zoster incidence prior to the implementation of a vaccination programme. This would be particularly useful in countries such as in Belgium, Ireland, the Netherlands, Portugal and the UK, where there are limited alternative sources of information regarding these diseases. In addition, sentinel hospital-based systems for varicella (such as that existing in the Netherlands up to July 2007) can be useful for assessing the risk of varicella complications and their outcomes. In six Countries (Belgium, France, Germany, the Netherlands, Ireland, and the UK) sentinel systems can be used to derive information on the incidence of zoster.

Sentinel system data can also provide data for assessing the impact of immunization once a vaccination programme is implemented. In the USA, where varicella vaccines have been introduced in the routine immunization schedule and where varicella is not included as a notifiable disease, the evaluation of vaccine effectiveness has been largely based on active surveillance in sentinel sites (10).

In particular, sentinel systems can contribute to monitoring changes in the age distribution of varicella cases, and in the incidence of herpes zoster (11). In fact, results of mathematical models have shown that introducing universal vaccination without reaching high vaccination coverage rates could cause a shift in the age of infection, with an increased number of individuals who will acquire varicella in adolescence or adulthood, when the rate of complications is higher (12). As far as herpes zoster is concerned, it has been suggested that vaccination programs could lead to an increase in herpes zoster cases, due to the reduction of re-exposure to the natural virus, which as been shown to be significantly associated to a lower risk of developing zoster (13). Data from USA also show that as varicella vaccine coverage in children increased, the incidence of varicella decreased and the occurrence of herpes zoster increased (14).

Two major sources of biases exist in sentinel networks. Firstly, the population followed by participating physicians (or hospitals) may not be representative of the entire country population. Secondly, denominators to estimate incidence figures may not be available, or may be inappropriate (15). Determination of the underlying population at risk is especially problematic for countries without patient registration lists.

This inventory showed that there is a wide heterogeneity in the availability of denominator data, and detailed information on the population under surveillance was available in three Countries only (Italy, Portugal, and UK). Since the denominator is derived in different ways from Country to Country, incidence rates are also expressed differently. Surveillance results can be then interpreted only with an in-depth knowledge of each specific system. It is crucial therefore that a brief description of the sentinel system and information regarding the type of denominator used to calculate incidence rates be given when these data are disseminated through websites, and publications. In this regard, the information provided by this survey can be a useful start.

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## Appendix: Characteristics of sentinel systems.

**Note:** Only VPD included in EUVAC.NET (i.e. measles, mumps, rubella, congenital rubella, pertussis, and varicella) are listed in "Diseases under surveillance". The sentinel system may also cover other diseases.

### 1) **Belgium – Pedisurv**

**Established:** October 2002 (Jan 2007 for CR)

**Diseases under surveillance:** measles, mumps, CR (included in Jan 2007). Measles is also covered by other surveillance system in Belgium.

**Objectives:** epidemiological surveillance of diseases with an elimination target or of new emergent diseases, follow-up of the effects of preventive measures

**Funding:** Ministry of Health, Flemish and French-speaking communities

**Type of population under surveillance:** general population (measles and mumps)

**Type of sites involved:** primary care paediatricians, GPs in Brussels. The above sites participate on a voluntary basis and are not paid for their participation.

**N. sites/physicians:** 889 physicians (497 paediatricians, 392 GPs). In 2005, 65% of participating physicians reported.

**Denominator:** information not available

**Case definitions:** yes

**Information reported:** gender, date of birth, date of onset/lab test, vaccination status, complications, death, other: clinical signs, laboratory testing, possible sources of infection (measles, mumps)

**Collection of data:** monthly, by fax, electronic mail, regular mail, web

**Data analysis:** weekly (rapid control of data), analysis and feedback every 3 months

**Data dissemination:** every 3 months to participating sites, ministry of Health, regional health authorities, other surveillance/vaccination committees, by mail, electronic mail.

**System monitoring:** yes, zero reporting, number of months participation per participant

**Systematic reminder operations:** yes

**Cost evaluation:** no

**Website:** [www.iph.fgov.be/pedisurv](http://www.iph.fgov.be/pedisurv)

## 2) **Belgium sentinel GP physician network**

**Established:** The network was established in 1979, but varicella and varicella zoster were included only in 2006.

**Diseases under surveillance:** varicella, varicella zoster. Sole surveillance system for varicella and VZV.

**N. sites/physicians:** 150-160. In 2005, 95% of participating physicians reported.

**Objectives:** evaluation of public health problems and their importance within the general population, study of the management and follow-up of health problems by GPs, evaluation of the impact of prevention and vaccination programs.

**Funding:** by the different regions (Flemish and French-speaking community)

**Type of population under surveillance:** General population (1.76%)

**Type of sites involved:** GPs. Physicians participate on a voluntary basis and are paid for their participation (€250/year).

**Denominator:** Information regarding the population potentially served by sentinel sites is obtained through the number of consultations.

**Case definitions:** yes

**Information reported:** gender, date of birth, date of onset, vaccination status, complications, and death

**Collection of data:** weekly, by regular mail

**Data analysis:** yearly

**Data dissemination:** yearly, to participating sites, regional health authorities, advisory committee for vaccination, press

**System monitoring:** yes

**Systematic reminder operations:** yes

**Cost evaluation:** no

**Website:** [www.iph.fgov.be/epidemie/epien/index10.htm](http://www.iph.fgov.be/epidemie/epien/index10.htm)

### 3) Cyprus

**Established:** May 2003

**Diseases under surveillance:** measles, mumps, rubella, pertussis, varicella, all of which are also covered by other surveillance systems in the country.

**N. sites/physicians:** 75 physicians. On average, 60% of participating physicians reported in 2005.

**Objectives:** early detection and control of communicable selected diseases

**Funding:** Ministry of Health

**Type of population under surveillance:** general population (percentage of the population under surveillance is not known, 5% of GPs in the country participate)

**Type of sites involved:** GPs, primary care paediatricians, hospital paediatricians, hospital emergency departments/outpatients. Sites participate on a voluntary basis and are not paid for their participation.

**Denominator:** N. consultations

**Case definitions:** yes

**Information reported:** diagnosis, age group, (<14 years, ≥14 years), week of reporting

**Collection of data:** weekly, by telephone, fax, electronic mail

**Data analysis:** weekly

**Data dissemination:** every 6 months, to participating sites, MOH, professional organizations, by bulletin boards

**System monitoring:** yes

**Systematic reminder operations:** yes (phone call)

**Cost evaluation:** no

**Website:** No

4) **France-Sentiweb**

**Established:** November 1984

**Diseases under surveillance:** measles, mumps, varicella, varicella zoster. Sole surveillance system for mumps, varicella, and varicella zoster. Measles is a statutory notifiable disease since July 2005.

**N. sites/physicians:** 1270. On average 21% of participating physicians reported in 2005.

**Objectives:** evaluation of geographical and temporal evolution of the disease, detection of outbreaks, evaluation of disease characteristics

**Funding:** Institut de Veille Sanitaire (InVS); Institut National de la Santé e de la Recherche Médicale (INSERM)

**Type of population under surveillance:** general population (0.42% estimated by the ratio n. participating GPs/overall n. GPs)

**Type of sites involved:** GPs. Physicians participate on a voluntary basis and are not paid for their participation.

**Denominator:** national and regional census data

**Reporting criteria:** clinical. Lab confirmation required for hepatitis A/B.

**Case definitions:** yes

**Information reported:** sex, age, date of onset, date of consultation, vaccination status, and complications

**Collection of data:** real-time basis through website

**Data analysis:** weekly

**Data dissemination:** weekly to participating physicians, state health agencies, professional organizations, press, public (by open subscription weekly newsletter) by reports and electronic bulletins

**System monitoring:** yes

**Systematic reminder operations:** yes

**Cost evaluation:** no

**Website:** [www.sentiweb.org](http://www.sentiweb.org)

5) **France- Sentinel Network of hospital paediatricians (Renacoq)**

**Established:** March 1996

**Diseases under surveillance:** pertussis (sole surveillance system for pertussis in France)

**N. sites/physicians:** 43 hospitals (1 paediatrician and 1 microbiologist per hospital). On average, 90% of participating physicians reported.

**Objectives:** to evaluate temporal evolution of the disease, and evolution of disease characteristics among children < 6 months age. Estimation of incidence rates in children <3 months of age, as virtually all cases in this age-group are hospitalized.

**Funding:** Institut de Veille Sanitaire (InVS)

**Type of population under surveillance:** children <6 months of age. Approximately 30% of paediatric hospital admissions are under surveillance.

**Type of sites involved:** hospital paediatricians and laboratories. Sites participate on a voluntary basis and are not paid for their participation.

**Reporting criteria:** clinical symptoms/signs, lab confirmation

**Denominator:** national census data

**Case definitions:** yes

**Information reported:** sex, date of birth, age, date of onset, date of consultation, vaccination status, complications, death, possible sources of infection

**Collection of data:** quarterly by electronic and regular mail

**Data analysis:** quarterly

**Data dissemination:** quarterly on website

**System monitoring:** yes

**Systematic reminder operations:** yes

**Cost evaluation:** no

**Website:** [www.invs.sante.fr](http://www.invs.sante.fr)

6) **Germany- Sentinel surveillance of Measles**

**Established:** October 1999

**Diseases under surveillance:** measles. In Germany, measles is also covered by the statutory reporting system.

**N. sites/physicians:** approximately 1100. On average, in 2005, 80% of participating physicians participated.

**Objectives:** laboratory supported surveillance of measles, virus genotyping, obtain information on complications, vaccination status and reasons for not being vaccinated

**Funding:** public- private partnership between Robert Koch Institute and 2 vaccine manufacturers

**Type of population under surveillance:** general population (% not defined)

**Type of sites involved:** GPs, primary care paediatricians. Physicians participate on a voluntary basis and are not paid for their participation.

**Denominator:** N. sentinel practices

**Reporting criteria:** clinical

**Case definitions:** yes

**Information reported:** sex, month and year of birth, date of onset, date of consultation, vaccination status, complications, death, reasons for not being vaccinated, date of rash, date of lab, hospitalisation, source of infection

**Collection of data:** monthly, by fax, electronic mail, regular mail

**Data analysis:** monthly

**Data dissemination:** monthly to participating sites, state and local health agencies, professional organizations, press, by mail/fax/email reports and bulletin boards. Also, presentations at workshops, congresses and twice a year publication in the Epidemiological bulletin.

**System monitoring:** yes

**Systematic reminder operations:** yes

**Cost evaluation:** no

**Website:** [www.agmv.de](http://www.agmv.de)

7) **Germany – sentinel surveillance of varicella and varicella zoster**

**Established:** April 2005

**Diseases under surveillance:** varicella, varicella zoster. These diseases are covered also by regional notification systems in Germany.

**N. sites/physicians:** 900. In the year 2005, on average 70% of physicians reported

**Objectives:** to monitor the frequency of varicella and its complications (primary objective), the frequency of herpes zoster, breakthrough varicella and herpes zoster cases, and vaccine coverage (secondary objectives)

**Funding:** public- private partnership between Robert Koch Institute and 2 vaccine manufacturers

**Type of population under surveillance:** general population

**Type of sites involved:** GPs, primary care paediatricians. Physicians participate on a voluntary basis and are not paid for their participation.

**Denominator:** N. consultations, N. sentinel practices

**Case definitions:** clinical

**Information reported:** sex, age group, date of onset, date of consultation, vaccination status, complications, death, n. patient contacts per week/month, n. vaccinations/month

**Collection of data:** monthly, by fax, regular mail, electronic mail

**Data analysis:** monthly, by region

**Data dissemination:** monthly to participating sites, state and local health agencies, professional organizations, by mail/fax/email, bulletin boards, website, presentation at workshops, congresses

**System monitoring:** yes

**Systematic reminder operations:** yes

**Cost evaluation:** no

**Website:** [www.agmv.de](http://www.agmv.de)

8) **Greece**

**Established:** December 1999

**Diseases under surveillance:** measles, mumps, rubella, pertussis, varicella, all of which are also covered by the mandatory notification system in Greece.

**N. sites/physicians:** 282 physicians. In 2005, approximately 64% of participating sites/physicians reported.

**Objectives:** Epidemiological surveillance with focus on time trends of mild diseases of special public health interest, which do not require hospitalisation

**Funding:** Hellenic Centre for Disease Control and Prevention

**Type of population under surveillance:** general population

**Type of sites involved:** GPs, primary health centres. Physicians participate on a voluntary basis and are not paid for their participation.

**Denominator:** N. consultations

**Reporting criteria:** clinical

**Case definitions:** yes

**Information reported:** sex, age, vaccination status, week of consultation

**Collection of data:** weekly, by fax

**Data analysis:** weekly, by geographical area (Northern Greece, southern Greece, district of Attiki)

**Data dissemination:** weekly to participating sites, ministry of health

**System monitoring:** yes

**Systematic reminder operations:** yes

**Website:** no



9) **Ireland**

**Established:** October 2000

**Diseases under surveillance:** measles, mumps, rubella, varicella, varicella zoster. Measles, mumps and rubella are also covered by other surveillance systems in the country.

**N. sites/physicians:** 96 GPs (48 practices)

**Objectives:** to further develop surveillance of measles, mumps, rubella, varicella

**Funding:** Health Protection Surveillance Centre

**Type of population under surveillance:** general population (4.3% of this population is under surveillance)

**Type of sites involved:** GPs. Sentinel general practices are required to report and are paid for their participation.

**Denominator:** National population by age group (census data)

**Reporting criteria:** clinical. Lab confirmation required for measles

**Case definitions:** yes with the exception of varicella and varicella zoster

**Information reported:** sex, date of birth, age, date of onset, date of consultation, vaccination status

**Collection of data:** weekly, by e-mail

**Data analysis:** monthly

**Data dissemination:** monthly to participating sites, MOH, state and local health agencies, professional organizations, by mail/fax/email. Data also posted on the website

**System monitoring:** yes

**Systematic reminder operations:** yes

**Cost evaluation:** no

**Website:** [www.ndsc.ie](http://www.ndsc.ie)

10) **Italy - SPES**

**Established:** January 2000

**Diseases under surveillance:** measles, mumps, rubella, CR, pertussis, varicella. All diseases are covered by other surveillance systems in Italy.

**N. sites/physicians:** 324 paediatricians. On average, in the year 2005, 73% of physicians reported.

**Objectives:** to detect events correlated to health state of paediatric population; to collect epidemiological surveillance data on infectious diseases in paediatric population; to estimate the occurrence of complications of infectious diseases; to evaluate effectiveness of vaccination programs

**Funding:** National Institute of Health (Istituto Superiore di Sanità-ISS); three paediatric associations

**Type of population under surveillance:** children 0-14 years of age (2.5%)

**Type of sites involved:** primary care paediatricians, which participate on a voluntary basis and are not paid for their participation

**Denominator:** N. patients registered (patient registration lists)

**Reporting criteria:** clinical, lab confirmation required for CRS and bacterial meningitis

**Case definitions:** yes

**Information reported:** sex, date of birth, date of onset, vaccination status, complications, death, municipality of practice, lab confirmation for CR. For vaccinated children: commercial name of vaccine, n. doses received, year of last dose received

**Collection of data:** monthly by fax, web

**Data analysis:** monthly, by region and geographical area (North, Centre, South)

**Data dissemination:** monthly to participating sites, MOH, local health agencies. Reports via mail/fax/email. Data posted on website.

**System monitoring:** no

**Systematic reminder operations:** no

**Cost evaluation:** no

**Website:** [www.spes.iss.it](http://www.spes.iss.it)

11) **Netherlands- Nivel (sentinel network of GPs)**

**Established:** The network was established in 1970; pertussis was included in the year 1998 and varicella in the year 2000.

**Diseases under surveillance:** pertussis and varicella. Pertussis is also covered by other surveillance system in the Netherlands. Varicella and varicella zoster were under surveillance by the Pedianet sentinel system from July 2006 to July 2007.

**N. sites/physicians:** 60 GPs (45 practices). Unknown percentage participated in 2005

**Objectives:** to estimate the incidence of pertussis and varicella infections in the general population

**Funding:** Ministry of Public Health Welfare and Sport, project subsidies

**Type of population under surveillance:** general population (1%)

**Type of sites involved:** GPs, on a voluntary basis and not paid for their participation

**Denominator:** N. sentinel practices, Population in age category

**Reporting criteria:** clinical

**Case definitions:** yes

**Information reported:** sex, date of birth, vaccination status, type of laboratory confirmation

**Collection of data:** weekly, by paper form

**Data analysis:** yearly, by geographical area (North, East, South, West)

**Data dissemination:** yearly to participating sites, MOH. By reports and scientific publications

**System monitoring:** yes

**Systematic reminder operations:** not specified

**Cost evaluation:** unknown

**Website:** [www.nivel.it](http://www.nivel.it)

12) **Netherlands Pedianet (sentinel hospital paediatricians)**

**Established:** July 2006. This surveillance system was in place for one year only, until 1 July 2007.

**Diseases under surveillance:** varicella, varicella zoster (VZV). Sole surveillance system for these diseases.

**N. sites/physicians:** 200 hospital physicians, 85% average compliance

**Objectives:** to assess the incidence of severe VZV infections in children < 16 yrs of age admitted to hospital; to describe the complications of VZV infection; to describe the characteristics of children with severe VZV infection; to assess health care costs for severe VZV infection and mortality due to VZV in children < 16 years of age.

**Funding:** Netherlands National Institute for Public Health and the Environment (RIVM); Netherlands Paediatric Surveillance Unit (NSCK)

**Type of population under surveillance:** children < 16 years of age

**Type of sites involved:** hospital paediatricians. Sites participate on a voluntary basis and are not paid for their participation.

**Denominator:** population in age category

**Reporting criteria:** clinical

**Case definitions:** yes

**Information reported:** sex, date of birth, date of consultation, complications, death

**Collection of data:** monthly, by paper form

**Data analysis:** yearly, for whole country

**Data dissemination:** yearly, to MOH. Data are disseminated by reports/publications

**System monitoring:** not specified

**Systematic reminder operations:** not specified

**Cost evaluation:** unknown

**Website:** [www.nvk.pedianet.nl/index.htm](http://www.nvk.pedianet.nl/index.htm)

### 13) Portugal

**Established:** October 1989

**Diseases under surveillance:** varicella. Sole surveillance system for varicella.

**N. sites/physicians:** 147 GPs

**Objectives:** to estimate the incidence of selected diseases considered relevant for public health (e.g. diabetes, stroke, acute myocardial infarction, etc.); epidemiological surveillance of diseases, timely identification of outbreaks, to create a database in order to allow a deeper analysis of selected diseases

**Funding:** Instituto Nacional de Saúde Dr. Ricardo Jorge MoH (INSA)

**Type of population under surveillance:** general population

**Type of sites involved:** GPs, which participate on a voluntary basis and are not paid for their participation.

**Denominator:** N. patients registered

**Reporting criteria:** clinical/lab

**Case definitions:** not for varicella

**Information reported:** sex, age, date of onset, date of consultation, death, other, depending on the specific disease

**Collection of data:** weekly by regular mail/web

**Data analysis:** yearly, for whole country

**Data dissemination:** yearly, to participating sites, MOH, state health agencies, professional organizations

**System monitoring:** yes

**Systematic reminder operations:** no

**Website:** [www.onsa.pt](http://www.onsa.pt)

#### 14) **Switzerland**

**Established:** June 1986

**Diseases under surveillance:** measles, mumps, rubella, pertussis. Measles is covered also by other surveillance system.

**N. sites/physicians:** 199 physicians. On average in 2005, 89% of registered physicians send a weekly report for at least 75% of all weeks

**Objectives:** to evaluate effectiveness of vaccination programs by monitoring incidence trends of vaccine preventable diseases, to provide epidemiological data on frequent infectious diseases, to allow punctual surveys on different topics

**Funding:** Swiss Federal Office of Public Health

**Type of population under surveillance:** general population

**Type of sites involved:** GPs, primary care paediatricians. Physicians participate on a voluntary basis and are not paid for their participation.

**Denominator:** N. consultations

**Reporting criteria:** clinical

**Case definitions:** yes

**Information reported:** sex, date of birth, date of onset, week of consultation, vaccination status with vaccination details, complications, clinical features, laboratory results, epidemiological link, other cases in the surroundings, hospitalisation, municipality of the practice

**Collection of data:** weekly, one third of physicians report continuously by web (but at least on a weekly basis)

**Data analysis:** weekly

**Data dissemination:** weekly, by bulletin boards, electronic bulletins, to participating sites. All physicians in the country receive the Bulletin of the Swiss Federal Office of Public Health.

**System monitoring:** yes

**Systematic reminder operations:** yes

**Cost analysis:** no

**Website:**

[www.bag.admin.ch/k\\_m\\_meldesystem/00736/00815/index.html?lang=fr](http://www.bag.admin.ch/k_m_meldesystem/00736/00815/index.html?lang=fr)

15) **United Kingdom**

**Established:** 1967

**Diseases under surveillance:** measles, mumps, rubella, pertussis, varicella, varicella zoster. All except varicella are covered by other surveillance systems.

**N. sites/physicians:** 100 physicians. In 2005, 75% reported every week, 90% reported at least 40/52 weeks

**Objectives:** epidemiological surveillance, assessment of incidence and prevalence rates

**Funding:** Department of Health, Health Protection Agency

**Type of population under surveillance:** general population

**Type of sites involved:** GPs, which participate on a voluntary basis and are paid for their participation

**Denominator:** N. patients registered

**Reporting criteria:** clinical. Disease-based information is classified according to the Read code classification system and data on new episodes of illness are collected separately from data on ongoing or follow-up consultations

**Case definitions:** only for varicella. Lab confirmation is not required for reporting but vaccine preventable infections are followed up to ascertain if these were lab confirmed.

**Information reported:** sex, age group, week of consultation. Death information is only available when patient is de-registered by GP, this can be some time after death and data are not complete.

**Collection of data:** weekly, by e-mail and regular mail

**Data analysis:** weekly, by region (North, Central, South).

**Data dissemination:** weekly, to participating sites, MOH, state and local health agencies, professional organizations, international contacts (Netherlands), press (influenza), by reports via mail/fax/e-mail and through website

**System monitoring:** yes

**Systematic reminder operations:** yes

**Cost evaluation:** yes

**Website:** [www.rcgp.org.uk/bru/bru\\_home.aspx](http://www.rcgp.org.uk/bru/bru_home.aspx)