

A review of occupational disease surveillance systems in Modernet countries

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Background	To improve occupational health public policies and to facilitate coordinated research within the European Union to reduce the incidence of occupational diseases (ODs), it is important to know what OD surveillance systems exist and how they compare. Monitoring trends in occupational diseases and tracing new and emerging risks in a network (Modernet) participants are well placed to provide this information as most either contribute data to and/or are involved in the management of OD systems.
Aims	To identify and describe OD surveillance systems in Modernet countries with the longer-term objective of identifying a core template to be used on a large scale.
Methods	A questionnaire sent to Modernet participants, seeking structured information about the OD surveillance system(s) in their country.
Results	Overall 14 countries (70%) provided information for 33 OD systems, among them 11 compensation-based (CB) systems. Six countries provided information for non-CB systems reporting for any type of OD. The other systems reported either only ODs from a prescribed list, or specific diagnoses or diagnostic groups, with reports to most schemes being physician-based. Data collected varied but all systems collected diagnosis, age, gender, date reported and occupation (and/or industry) and most collected information on exposure.
Conclusions	This review provides information beneficial to both policy makers and researchers by identifying data sources useable to measure OD trends in European countries and opening the way to future work, both on trend comparisons within Europe and on the definition of a core template to extend OD surveillance on a larger scale.
Key words	Epidemiological surveillance; Europe; Modernet; occupational disease.

Introduction

Throughout the European Union (EU) and elsewhere surveillance systems exist to monitor the occurrence of occupational diseases (ODs; the term occupational disease is used here to encompass occupational disease/work-related ill-health/work-related illness/work-related disease). Some systems have been set up to recognize

and compensate ODs whereas others have been established to address issues independent of compensation. In 2012, the European Agency for Safety and Health at Work (EU-OSHA) prepared a report defining the priorities for occupational safety and health (OSH) research for 2013–20, one aim of which was to promote OSH research coordination in the EU [1]. To achieve this it is first important to know what systems exist throughout

the EU to monitor ODs. Secondly, to compare accurately the assumptions about OD occurrence arising from different systems it is necessary to know how they differ in terms of their aims, the type of data collected, methods of data collection, etc. and thus whether a consistent methodology is achievable.

Reviews of OD surveillance systems in the EU (and elsewhere) have been conducted previously [2,3]. Most notably, the European Commission published a report (May 2012) describing the current status of OD systems in 29 EU countries [4]. The information presented in this report varied in scope and depth between countries, particularly in relation to systems established for purposes other than compensation. Identifying such systems and subsequently obtaining comprehensive information may be difficult because it is likely to require consultation with a range of individuals and organizations.

Monitoring trends in occupational diseases and tracing new and emerging risks in a network (Modernet) was formed in 2007 with the aim of facilitating the exchange of information and knowledge by collaboration on a European scale [5]. Modernet consists of four main working groups, set up to address different, but overlapping, issues of OD surveillance; data quality, analysis of trends, analysing new risks and dissemination of information. Currently, 20 EU countries participate in Modernet with individuals encompassing a range of backgrounds, the majority of whom are either contributing data to and/or involved in the management of an OD surveillance system. To this end Modernet participants are a potential valuable source of information on the extent and type of OD surveillance systems within the EU.

This study aimed to identify and describe existing OD surveillance systems in countries participating in Modernet. It aimed to describe these systems in terms of their aims and the type of data collected and to determine whether key reporting fields and a core template could be identified with a view to the longer-term objective of establishing whether it is possible to optimize the surveillance of ODs at a European scale.

Methods

Within the Modernet working group established to address issues of data quality a subgroup was created tasked with identifying and describing the different OD systems in Modernet. To achieve this, a questionnaire was developed and refined during workshop meetings, with the aim of seeking structured information about the OD surveillance system(s) in the Modernet countries. Four key areas were identified, broadly categorized as 'general', 'aims of the system', 'variables reported' and 'coding classification systems used'. The information collected relating to the latter was subsequently analysed by a separate subgroup (of Working Group 1) and is not reported upon further here. Questions within these four areas were constructed by members of the subgroup,

based primarily on the type of information they deemed useful (for them as researchers) to know about other OD systems, in particular those areas of information not covered by previous reviews. Thus, in addition to providing a brief overview of the system and the type of data collected participants were asked about aspects of the OD systems which could bias the interpretation of the collected data, for example completeness of coverage and degree of under-reporting.

The questionnaire was piloted on Working Group 1 members and following feedback the final 38 questions were selected (Table 1). This questionnaire was then sent to all Modernet participants. If the information provided was unclear participants were contacted for further clarification. Non-responders were followed up by email on up to two occasions. The information provided was subsequently coded (where appropriate) and exported to Statistical Package for the Social Sciences for analysis.

Ethical approval was not required for this study. The project does not involve human participants, either directly (e.g. through use of interviews, questionnaires) or indirectly (e.g. through provision of, or access to, a person's data or tissue material).

Results

Participants from 16 of 20 countries in Modernet (80%) responded to the questionnaire with 14 countries providing information for at least one OD surveillance system and two (Malta and Iceland) replying that there was no official system for monitoring ODs. Of those responding, five countries (France, Republic of Ireland (ROI), Italy, Norway and the UK) returned information for >1 system, with information returned for 33 systems in total. Systems were categorized either as based (fully or partially) on compensation (11 systems (33%)) or not based on compensation (22 systems (67%)). The compensation-based systems all had data (in a computerized format) since at least 2003 with most (73%) having (computerized) data since at least 1993 (i.e. 20 years). For the non-compensation based systems, 15 (68%) had data since at least 2003 and 4 (18%) since at least 1993. For most, summary data (usually aggregated to an annual level) could be obtained from an associated website but access to individual, anonymized data was reported to be possible less frequently (and often depended upon the type of applicant).

Eleven countries returned information for compensation-based systems: Belgium, the Czech Republic, Finland, France, Germany, Hungary, ROI, Italy, Spain, Switzerland and the UK (Table 2). A compensation-based system was also acknowledged in Norway but the required information was not readily available and the questionnaire could not be completed. In Belgium, the Czech Republic, Finland, Hungary and Spain the attending physician notified the system of the suspected OD whereas for the others the notification was from the individual themselves or their employer (although

Table 1. Questions asked of Modernet participants about each of the occupational disease surveillance systems in their country

Section	Questions
General	1. Website address 2. Brief overview of the system 3. Modernet 'contacts' 4. Data availability/accessibility 5. Start date
'Aims' of the system	6. Is the system linked to compensation? 7. If yes, is there a list of compensated occupational disease? 8. If no, is the information on compensated diseases registered elsewhere? 9. Who reports? 10. What are the criteria for reporting? 11. Are cases medically diagnosed? 12. Does the system measure incidence, prevalence or both? 13. Does the system cover all geographical areas? 14. Does the system cover all economic sectors? 15. Has the population covered by the physicians been quantified? 16. Has the degree of under-reporting been quantified?
What variables are reported?	17. Diagnosis? 18. Individual susceptibility (e.g. pre-existing asthma)? 19. Date case diagnosed? 20. Date case reported? 21. Symptoms? 22. Date of onset of symptoms? 23. Age at diagnosis? 24. Age at reporting? 25. Date of birth? 26. Gender? 27. Place of birth? 28. Address of the worker? 29. Address of the workplace? 30. Occupation? 31. Economic sector? 32. Exposures (how is exposure described, is the duration of exposure recorded, is the level of imputability assessed (and if so, by whom))? 33. Any other non-occupational factors?
What coding classification systems are used for	34. Diagnosis? 35. Occupation? 36. Economic sector? 37. Exposures? 38. Who codes the data?

an accompanying medical diagnosis was required). In Germany all three groups (physicians, employers and employees) can notify the system.

ODs reportable to the compensation-based systems varied, with some set up to monitor (and compensate) only ODs on a prescribed list whereas other systems also enabled other ODs not on a prescribed list to be reported and, if proven to be occupational in nature, compensated (Table 3). Reporting criteria, in particular the level of proof required to attribute the OD to workplace exposure, varied between systems and between ODs. For some systems (Belgium, Spain and UK) exposure is described (e.g. type of agent, task or activity) by the reporting physician or the individual making the claim whereas for others (Czech Republic, France, Germany, Hungary, Italy and Switzerland) additional assessment and verification of the exposure is required by specialists (e.g. physicians or hygienists) reporting and/or assessing the claim.

All compensation-based systems surveyed here were established to be nationwide. However, the self-employed were frequently excluded (Belgium, Czech Republic, France, Hungary, ROI, Switzerland and the UK). The systems in Belgium and Switzerland also excluded military personnel and the French compensation system surveyed here (CNAMTS) also excluded civil servants and farmers (who were covered by a different insurance provider). The degree of under-reporting was reported as (at least partly) assessed for Finland, France and Spain only. However, specific information regarding the degree of under-reporting and the methods used to assess this phenomenon was not typically provided. For those compensation-based systems publishing incidence rates (the Czech Republic, Finland, Germany, Italy, Spain, Switzerland and UK) the denominator used was either national estimates of working population or employee numbers obtained from the relevant health insurance database.

The seven countries returning information for systems not linked to compensation were France, the ROI, Italy, Macedonia, the Netherlands, Norway and the UK (Table 4), with four (France, the ROI, Norway and the UK) returning information for more than one system. All of these (except Macedonia) provided information for at least one system for reporting any type of OD. Most systems within this category (19/22 = 86%) were based on reports (either voluntary or mandatory) from physicians including occupational physicians, general practitioners, organ specialists (chest physicians, dermatologists) and others (surgeons, neurophysiologists, pathologists, oncologists, allergy specialists and consultants in communicable diseases). The remaining three systems in this category were based on reports from employers or employees.

Some systems within this category were established to monitor specific diseases (e.g. ONAP2 and asthma) or specific disease groups (e.g. SWORD and respiratory disease) whereas others were set up for any type of OD to be reported (Table 5). Others (the national notification system in Macedonia and RIDDOR in the UK), although not linked to compensation, only required ODs on a prescribed list to be reported. Reporting criteria

Table 2. Compensation-based occupational disease surveillance systems in countries participating in the Modernet consortium

No.	Country (start date) ^a	System, website	Reporting mechanism
1.	Belgium (2000)	Belgium Compensation Fund for Occupational Diseases (FBZ), www.fmp-fbz.fgov.be/web/index.php	Any physician seeing a patient with a suspected OD is legally obliged to submit a declaration form to the FBZ who will then send the compensation form to the employee. A FBZ employed physician will subsequently determine recognition/compensation.
2.	Czech Republic (1991)	Czech Registry of Occupational Disease, http://www.szu.cz/publications-and-products/data-and-statistics/occupational	Any physician seeing a patient with a suspected OD is legally obliged to refer the patient to one of 15 (authorized) centres for ODs to be assessed by a specialized physician (who will subsequently determine recognition/compensation).
3.	Finland (1964)	Finnish Register of Occupational Diseases, www.ttl.fi/en/press/Pages/press51_2012.aspx	Any physician seeing a patient with a suspected OD is legally obliged to report the case to regional occupational health and safety administration. To apply for compensation, physicians must additionally notify the insurance companies (a physician employed by the insurance company will subsequently determine recognition/compensation).
4.	France (2002)	CNAMTS Occupational Disease (private sector employees-Social Security), www.risquesprofessionnels.ameli.fr/statistiques-et-analyse/sinistralite-atmp.html	The individual (or their representative) seeking compensation must make a claim to the relevant insurance fund (for 87% of French employees in the private sector this is the CNAMTS) who will subsequently determine recognition/compensation. This report is accompanied by a medical certificate describing the disease, established by the doctor chosen by the claimant.
5.	Germany (1975)	German Statutory Accident Insurance (DGUV), www.dguv.de/de/index.jsp	Any physician seeing a patient with a suspected OD is legally obliged to report the case to the statutory accident insurance. Also any employer who suspects a case has to report it. Patients or other insurers may report a case. The statutory accident insurance then processes the case and decides if it is recognized/compensated.
6.	Hungary (1996)	National Registry of Occupational Diseases and Excessive Exposure Cases, http://www.omfi.hu/	Any physician seeing a patient with a suspected OD is legally obliged to report the case to the regional labour inspectorate who will verify exposures and forward all data for expertise to the Department of Occupational Health at the Office of the Chief Medical Officer (OTH). After assessment, the social security payer (or the regional health insurance fund) will be informed and will make its decision regarding compensation.
7.	Republic of Ireland (1966)	Prescribed occupational illnesses, Department of Social Protection (DSP), www.welfare.ie/en/Pages/oib.aspx	The individual (or their representative) seeking compensation must make a claim to the Department of Social Protection. This report is accompanied by a medical certificate describing the disease, established by the doctor chosen by the claimant.
8.	Italy (1951)	Italian Institute for the insurance against work accidents (INAIL), www.inail.it/internet/default/Statistiche/Bancadastatistica/index.html	The individual (or their representative) seeking compensation must send a medical certificate describing the disease to their employer who must then make a claim to the insurance fund (INAIL) who will subsequently determine recognition/compensation.

Table 2. *Continued*

No.	Country (start date) ^a	System, website	Reporting mechanism
9.	Spain (1989)	Occupational Diseases Registry of the Social Security System, http://www.seg-social.es/Internet_1/index.htm	Any physician in the National Health Service seeing a patient with a suspected OD should refer the case to the a Unit of the Medical Inspectorate (or to the Unit of Occupational Health that exists in certain areas) who will forward it to his/her medical insurance company. The medical insurance company will determine recognition nevertheless the National Institute of Social Security (INSS) has the last word. Occupational Physicians (in charge of workers health surveillance) should also refer suspected ODs to the medical insurance companies for confirmation. If confirmed by the insurance companies, a report will be provided to the State Social Security System by an electronic procedure for reporting and registering OD which is called CEPROSS.
10.	Switzerland (1984)	Swiss National Accident Insurance Fund (SUVA), www.unfallstatistik.ch/	The employer of the individual seeking compensation must make a claim to the relevant insurance company who will then forward the claim to Suva (a physician employed by SUVA will subsequently determine recognition/compensation).
11.	UK (1991)	Industrial Injuries Disablement Benefit (IIDB) scheme, www.gov.uk/industrial-injuries-disablement-benefit	The individual (or their representative) seeking compensation must make a claim to the Department of Work and Pensions. This report is accompanied by a medical certificate describing the disease, established by the doctor chosen by the claimant.

^aFrom which data in a computerized format are available.

varied between systems but the most frequently cited was 'caused or aggravated by work'.

Most systems in this category were established to cover all geographical regions, the exceptions being the InVS coordinated systems in France and Malprof in Italy which (at least currently) only cover specific regions. Similarly, all systems were established to cover all types of workers although some (e.g. OPRA in the UK and the ROI, RNV3P in France) noted that coverage was uneven. For some of the physician-based systems (e.g. the Netherlands and Norwegian registries and UK SWORD and EPIDERM) the proportion of physicians actively participating and reporting had been estimated whereas others have carried out specific exercises to estimate the population covered by the physicians (e.g. the Netherlands Registry, UK THOR-GP and France MCP) and therefore to calculate denominators for incidence rates.

The study identified four variables common to all the OD systems, namely diagnosis, date reported, gender and age at reporting (either directly or deducible from the date of birth and date reported) (Figure 1). All systems also collected information on occupation and/or economic sector, with the majority (88%) collecting information on both. The exposure associated with the OD was recorded for all systems except five: two in the ROI (the compensation-based system and the labour market survey), the Hungarian CB system, Malprof in Italy and the UK LFS

system. For those systems that recorded duration of exposure this usually took the form of start and end date of employment. For the French musculoskeletal (TMS) and mesothelioma (PNSM) systems, exposure was assessed *via* a self-administered questionnaire whereas for the remainder the reporting physician (or employer/employee) was asked to describe the probable causal agent, task or activity. Variables related to geography (place of birth, address of worker and workplace), symptoms and pre-existing susceptibility were much less frequently reported (typically fewer than 50% of the systems).

Discussion

This exercise has identified compensation-based systems for OD monitoring in 11 out of the 20 countries within the Modernet consortium. Of these four also provided information for non-compensation-based OD systems (with at least one system in each country enabling the reporting of any type of OD). A further three countries provided information for non-compensation-based systems only. The type of data collected varied but all collected diagnosis, age, gender, date reported and occupation (and/or industry) and most collected information on exposure.

Among the countries not acknowledging a compensation-based system, two (the Netherlands and Macedonia) returned information for non-compensation-based

Table 3. Criteria for reporting to compensation-based occupational disease surveillance systems in countries participating in the Modernet consortium

No.	Criteria for reporting	Compensable ODs ^a
1. Belgium	If the disease is on a prescribed list (FBZ or EU) and the claimant can prove relevant exposure and disease, or is another disease with a possible origin in work (and the claimant can prove the relationship between exposure and disease) or is a disease whose symptoms are aggravated by work.	Any
2. Czech Republic	If the disease is on the list of ODs issued by the Czech Government and exposure to the particular risk factor has been proven by a public health authority as sufficient to cause the respective OD.	Prescribed list
3. Finland	Any new case of confirmed or suspected OD must be reported (there is a list but other ODs can be reported). The occupational exposure needs to be the main cause and the probability of association between the exposure and the outcome needs to be proven.	Any
4. France	If the disease is registered in one of the tables of ODs and if the related conditions are met there is a presumption of occupational origin of the disease and the disease is automatically recognized. Since 1993, other ODs (i.e. not in the tables and/or not meeting the criteria) can be reported (regional committees determine whether work-related/compensable).	Any
5. Germany	If the disease is on the prescribed list, the related conditions are met and the occupational origin is proven, the disease is recognized as an OD. Diseases which are not on the list can also be reported.	Any
6. Hungary	Medically confirmed diagnosis, confirmed exposure and confirmed link between disease and exposure. Criteria for each disease are not always meticulously set: experts decide based on their experience, available scientific information and specialist expertise if required.	Any
7. Republic of Ireland	If the disease is on the prescribed list and linked to a prescribed occupation or (for prescribed diseases other than deafness) the occupation is not on the prescribed list but the disease can be proven work-related (requires evidence of a probability of causation of 50% or more, i.e. >50% of the cases in the exposed population being attributable to the particular exposure).	Prescribed list
8. Italy	If the physician considers that the condition has been likely caused by occupational exposure. There is a list of diseases (related to job activities) that are legally defined work-related. If not on the list, to obtain compensation, an association between disease and work has to be proved.	Any
9. Spain	If the disease is on a prescribed list and linked to a prescribed occupation. If not on the list, a disease/exposure combination can be compensated (if the scientific evidence of causation is adequate) as a 'work accident' whereby it is recognized as being 'caused by work' but not as an OD. New disease/exposure combinations can be added to the list but this requires (in addition to the scientific evidence) an official and bureaucratic process to be followed and legal approval. If the worker disagrees with the decision taken, he/she can ask the National Institute of Social Security (INSS) for re-evaluation. If still in disagreement, he/she can go to the court and claim for compensation.	Any (excluding mental ill-health diseases not in the prescribed list)
10. Switzerland	If the disease is on the prescribed list and linked to a prescribed substance/task (requires evidence of a probability of causation of 50% or more) or (if not on the list) if the disease has been caused solely or to a seriously major degree by the occupational activity (requires evidence of a probability of causation of 75% or more).	Any
11. UK	If the disease is on a prescribed list and the claimant thinks they became ill or disabled as a result of an accident, disease or event that happened at work, in connection with work, or whilst on an approved or registered training scheme or course.	Prescribed list

^aThat is if the case meets the criteria specified.

systems (in the Netherlands ODs are not specifically compensated and the employer is obliged to pay social security payments regardless of the cause of the employee's injury or disease, whereas Macedonia has no current compensation for ODs). Both Malta and Iceland replied there was no formal system for gathering and analysing OD data

(in both cases ODs should be reported to the respective national authorities and are potentially compensated in Malta, but this is hindered by factors such as a lack of training in occupational medicine and a lack of incentives). Of the five non-responding countries, Romania has been documented elsewhere as having a national

Table 4. Non-compensation based occupational disease surveillance systems in countries participating in the Modernet consortium

No.	Country (start date)	System, website	Reporting mechanism
12.	France (2002)	InVS: programme de surveillance des troubles musculo-squelettiques (TMS), http://www.invs.sante.fr/fr/Dossiers-thematiques/Travail-et-sante/Troubles-musculo-squelettiques-TMS	The Health-Work department of the French Institute for Public Health Surveillance (InVS) coordinates monitoring programmes on work-related musculoskeletal diseases (TMS), mesothelioma (PNSM), asthma (ONAP2) and work-related disease (MCP). Participating physicians (voluntarily) report cases seen during their usual clinical practice (For MCP physicians report for a 2 week period every 6 months).
13.	France (1998)	InVS: The French National Program for Mesothelioma Surveillance (PNSM), http://www.invs.sante.fr/fr/Dossiers-thematiques/Travail-et-sante/Declaration-obligatoire-des-mesotheliomes	TMS—specialist physicians (occupational physicians, surgeons, neurophysiologist).
14.	France (2008)	InVS: Observatoire National des Asthmes Professionnels (ONAP2), http://www.invs.sante.fr/fr/Dossiers-thematiques/Travail-et-sante/Asthme-d-origine-professionnelle	PNSM—all specialist physicians (pathologists, pneumologists, oncologists, OD specialists) of 21 French districts that cover a population of ~18 million people (30% of the French population).
15.	France (2003)	InVS: Surveillance programme of Work-Related Disease (MCP), http://www.invs.sante.fr/fr/Dossiers-thematiques/Travail-et-sante/Maladies-a-caractere-professionnel	ONAP2—approximately 420 specialist physicians (pathologists, lung specialists and allergists, and occupational physicians) from six regions. MCP—approximately 800 occupational physicians from 13/22 regions.
16.	France (2001)	Réseau national de vigilance et de prévention des pathologies professionnelles (rnv3p), www.anses.fr/fr?pageid=1671&parentid=943	RNV3P is the national network for vigilance and prevention on ODs coordinated by ANSES (French agency for Food, Environmental and Occupational Health and Safety) and comprises 32 OD centres located in university hospitals.
17.	France (2001)	rnv3p-SST, www.anses.fr/fr?pageid=1671&parentid=943	Any physician seeing a suspected OD should refer the case to a RNV3P employed occupational physician to determine work-relatedness. Rnv3p-sst is dedicated to the reporting of all ODs diagnosed by occupational physician during their usual clinical practice.
18.	Republic of Ireland (ROI) (2005)	The Health and Occupation Research network in the Republic of Ireland (THOR-ROI): Surveillance of Work-related Respiratory Disease (SWORD), www.coeh.man.ac.uk/u/ire-sword	THOR-ROI is a surveillance network in the Republic of Ireland. Approximately 12 chest physicians (SWORD-ROI), 13 dermatologists (EPIDERM-ROI), and 22 occupational physicians (OPRA-ROI), voluntarily report any new ODs seen during their normal clinical practice.
19.	ROI (2005)	THOR-ROI: Occupational Skin Surveillance (EPIDERM), www.coeh.man.ac.uk/u/ire-epiderm	
20.	ROI (2007)	THOR-ROI: Occupational Physicians Reporting Activity (OPRA), www.coeh.man.ac.uk/u/ire-opra	
21.	ROI (1997)	Quarterly National Household survey (QHNS) http://www.cso.ie/en/qnhs/abouttheqnhs/whatistheqnhs/	The QNHS is a quarterly survey of a sample of households in Ireland collecting data on the labour market. The QNHS conducts special modules each quarter, one of which is the module on work-related accidents and illnesses.
22.	Italy (2000)	Malprof surveillance system of occupational diseases, www.ispesl.it/statistiche/index_mp.asp	Any physician seeing a suspected OD should report it to Local Health Units (LHU). Occupational physicians employed in the prevention services at the LHUs forward the data to Malprof. Currently 12 regions report to Malprof (80% of workers).
23.	Macedonia (2009)	Macedonia register of occupational diseases, http://www.imt.mk/occupdiseases_en.htm	Any physician seeing a suspected OD should notify the Regional Centres for Public Health (PHCs) who subsequently send the individual reports to the Institute for Public Health of the Republic of Macedonia for analysing and publishing.

Table 4. *Continued*

No.	Country (start date)	System, website	Reporting mechanism
24.	The Netherlands (1997)	National notification and registration system, ncvb.amc.nl/NCVB-MenR/dyn/user/login	Any occupational physician seeing a patient with a suspected OD is legally obliged to report the case to the registry (operated by the Netherlands Center for Occupational Diseases) but only 20% of physicians are estimated to report.
25.	Norway (1987)	Registry of Work-Related Diseases, Illnesses, and Disorders at the Labour Inspectorate, http://www.arbeidstilsynet.no/artikkel.html?tid=79289	Any physician seeing a suspected OD is legally obliged to report it to the registry (but it is estimated only 5% of physicians report).
26.	Norway (2009)	National Institute of Occupational Health (NIOH) registry, https://stami.no/	A national, anonymous registry. Any physician seeing a suspected OD in Norway's six occupational medicine clinics (based in large regional hospitals) report the case to the registry.
27.	UK (1989)	THOR: SWORD, www.coeh.man.ac.uk/u/sword	THOR is a UK-wide surveillance network. Approximately 415 chest physicians (SWORD), 149 dermatologists (EPIDERM), 283 occupational physicians (OPRA), 231 general practitioners (THOR-GP) and 26 consultants in communicable disease control (SIDAW) voluntarily report any new ODs seen during their normal clinical practice. Physicians participate either monthly (~10% of all participants) or for one randomly selected month per year (~90%).
28.	UK (1993)	THOR: EPIDERM, www.coeh.man.ac.uk/u/epiderm	
29.	UK (1996)	THOR: OPRA, www.coeh.man.ac.uk/u/opra	
30.	UK (2005)	THOR in General Practice (THOR-GP), www.coeh.man.ac.uk/u/thorgp	
31.	UK (1996)	THOR: Surveillance of Infectious Diseases at Work (SIDAW), http://www.population-health.manchester.ac.uk/epidemiology/COEH/research/thor/schemes/sidaw/	
32.	UK (2001)	Self-reported Work related Illness survey (SWI), www.hse.gov.uk/statistics/publications/swi.htm	
33.	UK (1974)	The Reporting of Injuries, Diseases, and Dangerous Occurrences Regulations (RIDDOR), www.hse.gov.uk/riddor/index.htm	Employers and other specified duty holders are legally obliged to report any workplace incident to the Health and Safety Executive.

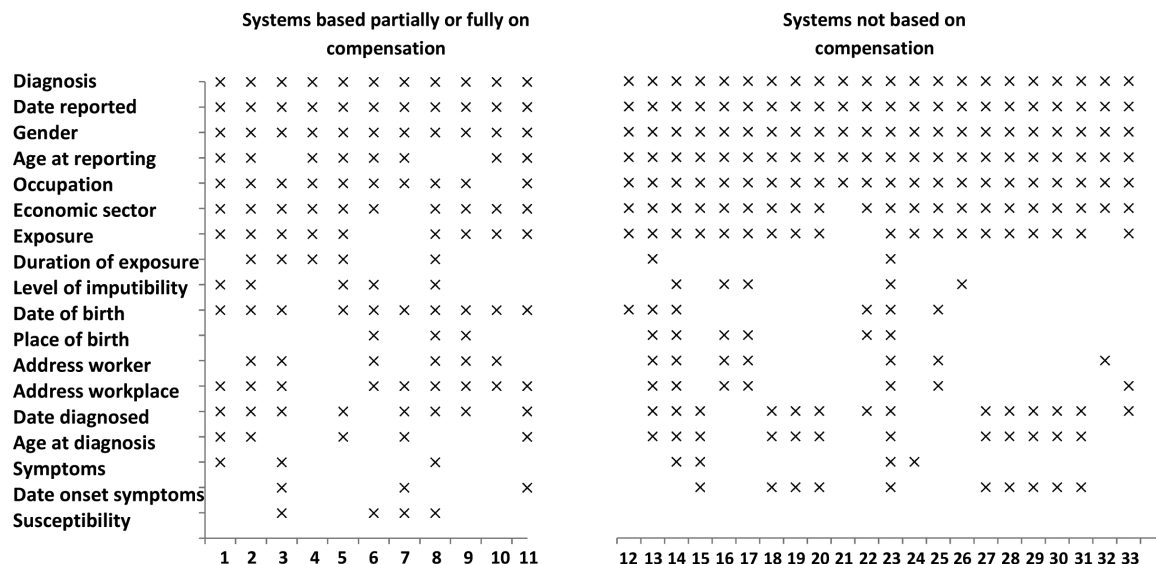


Figure 1. Variables reported to each of the occupational disease surveillance systems in countries participating in the Modernet consortium.

Table 5. Criteria for reporting to non-compensation based occupational disease surveillance systems in countries participating in the Modernet consortium

No.	Criteria for reporting	Reportable ODs
12. France (TMS)	Any new musculoskeletal disorder seen by the physician (whether considered occupational or not).	Musculoskeletal
13. France (PNSM)	Any new case of pleural mesothelioma seen by the physician (whether considered occupational or not). A specific reporting procedure is defined and applied to all specialized medical structures.	Pleural mesothelioma
14. France (ONAP2)	Any new case of asthma the physician considers caused by occupational exposure. The physicians rate the probability of occupational asthma (OA) as possible or certain. Four experts subsequently review the reported cases (and exclude cases of work-aggravated asthma) and then rate the probability of OA in three categories: typical asthma (with latency period), asthma-like syndrome (or atypical asthma), and reactive airways dysfunction syndrome (RADS; without latency period).	Asthma
15. France (MCP)	Any case (which has not been compensated elsewhere) where the physician considers the illness/symptoms to be caused or aggravated by work.	Any
16. France (rnv3p)	Any new case which has been referred to an occupational disease centre (in the RNV3P network). At the OD centres, the strength of the association and each suspected causal agent is rated by an academic occupational health expert on a four class scale (nil, possible, probable, certain).	Any
17. France (rnv3p-sst)	Any new case the physician believes to have been caused or aggravated by work.	Any
18. Republic of Ireland (ROI) (SWORD)	Any new case seen by a physician that they consider more likely than not, on a balance of probabilities, to have been caused or aggravated by work, (workplace exposure need not be the sole cause of the condition). The decision on work-relatedness is up to the physician although some guidance (accessible from the THOR-ROI website) is provided.	Respiratory
19. ROI (EPIDERM)		Skin
20. ROI (OPRA)		Any
21. ROI (QHNS)	Individuals are asked whether they have had any illnesses or disabilities in the past 12 months they believe were caused or made worse by their work and to describe most recent work-related illness.	Any
22. Italy (Malprof)	Any new case the physician considers to have been likely caused by occupational exposure.	Any
23. Macedonia	Any case as defined in the list of occupational diseases and the law for health evidence.	Prescribed list
24. The Netherlands	Any new case seen by a physician that they consider more likely than not, on a balance of probabilities, to have been caused or aggravated by work, (workplace exposure need not be the sole cause of the condition) determined using an algorithm and registration guidelines.	Any
25. Norway	Any new 'disorder' the physician considers caused or made worse by work. 'Disorders' encompass both diagnoses specified in ICD-10 and symptoms and signs of health problems.	Any
26. Norway (NIOH)	Any new case which has been referred to an occupational medicine clinic. At the clinic, the likelihood of work-relatedness is assessed (probable, possibly, probably not).	Any
27. UK (SWORD)	Any new case seen by a physician that they consider more likely than not, on a balance of probabilities, to have been caused or aggravated by work, (workplace exposure need not be the sole cause of the condition). The decision on work-relatedness is up to the physician although some guidance (accessible from the THOR website) is provided.	Respiratory
28. UK (EPIDERM)		Skin
29. UK (OPRA)		Any
30. UK (THOR-GP)		Any
31. UK (SIDAW)		Infectious
32. UK (SWI)	Individuals are asked the screening question 'within the last 12 months have you suffered from any illness, disability or other physical or mental problem that was caused or made worse by your job or work you have done in the past'.	Any
33. UK (RIDDOR)	Reportable incidents include deaths and injuries, specified occupational diseases (linked to specific occupational exposures), dangerous occurrences and gas incidents arising through work.	Prescribed list

compensation-based system [3] but no further information was obtained for Albania, Bosnia and Herzegovina and Croatia. Of the 11 systems four did not enable the reporting or compensation of mental health disorders such as 'stress' even though 'stress' is the second most frequently reported work-related health problem in Europe [6]. For the remainder any type of disease was reportable and, if proven to be occupational, could be compensated. However, the level of proof required (and the likelihood of compensation) varied both between type of OD and between countries. For example, most countries accepted conditions such as mesothelioma (that are almost exclusively occupational) as qualifying for compensation, but for other conditions, such as asthma, greater (and varying) levels of proof were required.

Seven countries returned information for one or more non-compensation based system. However, it is acknowledged that there may be other systems of this type within Modernet countries for which information was not returned. For example some participants (particularly those without a representative in the working group) may have been less aware of the study's aims to describe all OD monitoring systems within a country, not just the national, compensation-based system, or less motivated to fulfil them compared with others. There may also be additional OD systems that are not known to the participants. The criteria for reporting a case to non-compensation based systems were generally less stringent, reflecting the often wider epidemiological aims of such systems compared with those based on compensation, the most commonly cited being if the reporter believed the condition to have been caused or aggravated by work (and unless the system was set up to monitor a specific disease or disease group any type of OD was usually reportable). It was not an objective of this study to agree a definition of 'occupational disease', used here to encompass the broader spectrum of terms such as occupational disease, work-related ill-health, work-related illness and work-related disease. Although there may be merit in doing so, particularly for those systems linked to compensation, as seen here two thirds of the systems identified were set up for reasons other than compensation. Interestingly, respondents for only three systems within this category (ONAP2 and rnv3p in France and the NIOH registry in Norway) stated that a measure of how likely they thought the condition was to be work-related was required.

Most systems surveyed here were established to allow reporting of ODs from all geographical regions and from all economic sectors within the participating country. However, participants generally acknowledged that ODs were under-reported (although to what extent was generally unknown or only partly known). One of the main factors contributing to under-reporting is under-recognition, that is the individual and/or physician not associating the condition with work [7,8]. For those systems based on compensation, under-reporting may also occur because

the individual is unaware of the availability of compensation or do not meet its eligibility criteria. For those systems based on physician reporting, the degree of under-reporting will also be affected by the level of physician participation. This will vary amongst the different systems (and also over time), in part depending on the nature of reporting (i.e. voluntary or mandatory), but other factors, for example physician workload, level of training in and affinity with occupational health or area of specialism will also play a role. There may also be under-reporting of ODs from specific sectors of the workforce. Most frequently participants responded that the self-employed were not covered, a sector which accounts for ~15% (and rising) of the EU working population [9]. Other systems reported limited coverage to specific sectors of the workforce. For example access to an occupational physician within the UK is known to be biased towards the public sector and larger industries and this is reflected in the cases reported to the UK surveillance system for this physician group (OPRA) [10]. However, for some systems respondents reported that steps had been taken to quantify the population (denominator) covered by the system, thus enabling the calculation of more accurate incidence rates [11,12].

Although the European Commission has previously published a comprehensive report describing the current status of occupational disease systems in the EU [4], this survey provides additional useful information, particularly regarding those systems not based on compensation and particularly in relation to the variables collected by the systems. This additional information is beneficial both to other researchers (who may want to carry out collaborative or comparative studies) but also in helping to identify a 'core system' with common reporting fields and coding systems, thus helping to optimize OD surveillance on a European scale. The key variables common to most (if not all) of the OD systems surveyed here were diagnosis, date reported, gender, age, occupation, economic sector and probable causal agent. These variables are the minimum setting to ensure reliable and meaningful surveillance of ODs at a large scale for policy-making and research on occupational health trends. They can therefore be viewed as the 'core variables' required for meeting this key objective, although systems with other aims, for example sentinel systems to capture 'new and emerging risks', may require additional variables. An important issue to address (and currently in publication) concerns the codification used to record these core variables when relevant. This work is essential to further achieve reliable trans-national comparisons.

In conclusion, this study provides a useful review of current OD monitoring systems within the Modernet consortium, complementary to existing reviews of OD monitoring in the EU [4]. This information is beneficial to policy-makers and researchers in that it identifies data sources (some of which may not have been widely known) which could be used to measure EU incidence and trends in incidence in ODs. It has also highlighted some of the differences between the collection systems

and importantly also areas of commonality between the systems. A step forward has already been achieved with some comparisons of trends on a subset of ODs within a few Modernet countries [13].

The proposed future work, in particular the move towards the identification of a 'common template', will further increase the validity and usability of results presented here.

Key points

- Thirty-three occupational disease surveillance systems have been identified and described through a survey of the 20 European Union countries which are members of the Modernet network.
- Seven variables are suggested for inclusion in a common template for surveillance of occupational diseases at an international level.
- Further work is needed to define and propose a structured system for large scale monitoring of incidence and trends in work-related diseases.

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Conflicts of interest

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