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**STATUS OF WATER-RELATED DISEASE SURVEILLANCE IN THE UNECE/WHO-
EURO REGION**

Submitted by the Chairperson of the Task Force on Surveillance

Summary

Water-related diseases continue to cause a high burden of mortality and morbidity to the countries of the European Region. Parties to the Protocol on Water and Health are committed to the sustainable use of water resources, the provision of safe drinking-water and adequate sanitation to all people of the European Region, and to the reduction of the burden of water-related diseases. A specialized Task Force operating under the leadership of Italy implements a work plan aimed at strengthening the capacity for water-related disease surveillance, outbreak detection and contingency planning. Parties to the Protocol are obliged to set targets, and report on progress on water-related disease surveillance. The present paper aims to provide a baseline assessment of national capacities for water-related disease surveillance on the basis of the replies to a questionnaire. This was elaborated in English and Russian and administered to 53 countries, 15 of which replied. The results confirm the heterogeneity in surveillance systems, the weakness of many countries to adequately survey emerging water-related diseases, and the need for specific remedial action. The findings of the exercise will form the basis for future action under the Protocol on Water and Health.

TABLE OF CONTENT

Introduction.....	3
Methodology.....	4
Results.....	5
Legal aspects of water-related disease surveillance.....	7
International Health Regulations	7
Protocol on Water and Health.....	7
Sub-regional legal instruments	8
General aspects on surveillance systems on communicable diseases	8
Surveillance: Structure, coordination and reporting.	9
Countries of EUR-A subregion	9
Countries of the EUR-B Subregion	10
Countries of the EUR-C Subregion	10
Conclusion on surveillance structure.....	11
Case confirmation.....	12
Public information	12
Legal basis	12
Findings	13
Data characteristics	14
Outbreak detection.....	14
Epidemic preparedness	15
Response capacity.....	16
Training.....	16
Databases and Mapping/GIS Resources	16
Discussion and conclusion.....	17

Introduction

At the end of the 20st century, 32,800 deaths were registered in Europe from diarrhoeal diseases as a result of unsafe water, sanitation and hygiene¹ Unsafe water, sanitation and hygiene are responsible for 4.6% of DALYs in low and middle income countries, a group to which many European countries belong²

Some of the pathogens that are known to be transmitted through contaminated drinking-water lead to severe and sometimes life-threatening disease; examples include typhoid, cholera, infectious hepatitis, and diseases caused by *Shigella* spp. and *E. Coli* O 157 (WHO, 2004). Water related diseases (WRDs) represent a high percentage of the burden of communicable diseases and death in developing countries. Diarrhoeal diseases kill an estimated 1.8 million people each year (WHO 2005). Among children under five years in developing countries, diarrhoea accounts for 17% of all deaths (United Nations 2006). An estimated 94% of the diarrhoeal burden of disease is attributable to the environment, and associated with risk factors such as unsafe drinking water, lack of sanitation and poor hygiene (Prüss-Üstün & Corvalán 2006).

In the eastern Europe, Caucasus and central Asia, diarrhoeal diseases constitute a serious cause of death. In the period between 1995 and 2000 it can be reasonably estimated that nearly half a million children (438,306) died form diarrheal disease (WHO/UNECE, 2007).

But WRDs, also represent a significant burden of communicable diseases in developed countries.

From 1999 to 2006 in the WHO-UNECE subregion EUR-A (27 countries of the European Union and Israel), 62.020 cases of viral hepatitis A, 53.503 cases of shigellosis, 11.830 cases of enterohaemorrhagic enterohaemorrhagic *Escherichia coli* (EHEC), 7.045 cases of typhoid fever and, 209 cases of cholera, have been reported in addition to 746.513 cases of campylobacteriosis, 75.950 cases of giardiasis and 41.718 cases of cryptosporidiosis (WHO/UNECE, 2007).

In the Annual Epidemiological Report on Communicable diseases in the EU and EEA/EFTA countries, data referring to the year 2006 show that 179,510 confirmed cases of campylobacteriosis were reported by 24 EU Member States, Iceland, and Norway (ECDPC, 2008). Campylobacter continues to be the most frequently reported gastro-enteric pathogen in the EU and EEA/EFTA countries with an incidence of almost 40 cases per 100,000, even though there seems to be a slight decline in numbers from 2005 to 2006. Enterohemorrhagic *E. Coli* infections appear to be declining, with a notification rate in 2006 of just over 1 case per 100,000, although some countries report substantially higher numbers, especially in young children.

1

Reference:

URL

http://www.who.int/healthinfo/global_burden_disease/CRA_Disease_Dth6_2004.xls accessed 10 December 2009.

² Anon. (2009) Global Health Risks – Mortality and burden of disease attributable to selected major risks. WHO Geneva available from available from URL: http://www.who.int/healthinfo/global_burden_disease/global_health_risks/en/index.html accessed 10 December 2009

Outbreaks of WRDs have been documented also as a consequence of ingestion of contaminated shellfish (Bean *et al.*, 1996; CDC, 1998; Levine *et al.*, 1993; Hlady and Klontz., 1996; Pontrelli *et al.*, 2008; Guillois-Bécel *et al.*, 2009) and irrigated crops (Shuval *et al.*, 1986; WHO, 1989; National Research Council, 1996).

In spite of the importance of these diseases, the experience has shown that the systems for their detection are typically inefficient in countries at all levels of socioeconomical development, and failure to detect outbreaks is not a guarantee that they do not occur (Poullis *et al.*, 2002; WHO, 2004). Outbreaks of WRDs may affect large numbers of persons, and the first priority in developing and applying controls on drinking-water quality should be the control of such outbreaks. WRDs also contribute to background rates of diseases in non-outbreak situations (WHO, 2004).

The surveillance of outbreaks and cases of WRDs are intended to characterize the epidemiology of outbreaks, identify changing trends in the etiologic agents and other risk factors associated with water, identify major deficiencies in providing safe drinking-water, encourage public health personnel to detect and investigate WRDs and foster collaboration among local, regional and national, agencies on initiatives to prevent WRDs. Data from these surveillance systems are also useful for defining research priorities and improving water-quality regulation development.

In the European Union (UE) there is no specific legislation on water-related diseases; with the publication of the decision 2119/98/EC, a network for the epidemiological surveillance of communicable diseases has been created. Member States are obliged to notify and report some communicable diseases on the basis of the decision 2000/96/EC and 2002/253/EC, which includes diseases common to those of the Protocol on Water and Health (cholera, viral hepatitis A, campylobacter, cryptosporidiosis, giardiasis, enterohaemorrhagic *E. Coli*), and others that can be transmitted by water (listeriosis, leptospirosis).

One of the pillars of the Protocol on Water and Health³ to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes (hereinafter “the Protocol”) is the establishment of surveillance, early warning and response systems to prevent and control the outbreak of water-related diseases (WRDs). At the first meeting of the Parties to the Protocol held in Geneva the 17-19 January 2007, one of the activities approved was the assistance to Parties and non-Parties in establishing and/or strengthening surveillance systems and outbreak detection, early-warning systems, contingency plans and response capacities with the general aim to prevent, control and reduce water-related diseases.

A task force created with the aim to accomplish this task elaborated a questionnaire aimed at assessing the current capacity for water-related diseases surveillance in Parties and non Parties of the European Region.

Methodology

The questionnaire was structured into ten thematic sections: 1) general aspects; 2) structure-coordination and reporting, 3) case confirmation ability, 4) capacity of response, 5) outbreak

³ United Nations Economic Commission for Europe (1999) Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes UNECE available from URL: <http://www.unece.org/env/documents/2000/wat/mp.wat.2000.1.e.pdf>

detection, 6) laboratory capability, 7) epidemic preparedness, 8) data characteristics, 9) training, and 10) database and mapping and public information.

The questionnaire was made available in electronic form on the website of the Higher Institute for Public Health, Rome Italy.

Paper copies were distributed to the network of Focal Points established under the Protocol on Water and Health established by Decision I/4 of the Meeting of the Parties (Geneva, Switzerland, January 2007). Focal Points are mandated to 'provide to the secretariat information that could be of use to Parties and non-Parties in the implementation of the Protocol'. The network of technical contacts of the WHO Regional Office for Europe was also used for the distribution, especially in non-Party countries.

The questionnaire as well as information on registration, access and compiling of the online version were sent to the national focal points for the Protocol on Water and Health in the countries that ratified, and all 53 countries served by the WHO Regional Office for Europe.

The questionnaire focused on priority, emerging and locally important water-related diseases (WRDs) identified in the context of the Protocol. Priority WRDs were defined by the Parties as those with high epidemic potential such as cholera, enterohaemorrhagic *E. coli*, viral hepatitis A, bacillary dysentery and typhoid fever. Emerging WRDs include campylobacteriosis, cryptosporidiosis, giardiasis, and legionellosis. Locally important WRDs refer to diseases as the blue-baby syndrome, arsenicosis, viral infections (particularly noroviruses), and parasitic diseases.

Results

Fifteen countries replied to the questionnaire: Andorra, Finland, Germany, Belgium, Czech Republic, Italy, Norway, Armenia, Georgia, Slovakia, Turkey, Belarus, Estonia, Hungary, and the Republic of Moldova (Fig. 1). On the basis of child and adult mortality rates, these countries have been grouped into WHO/UNECE subregions EUR-A (Andorra, Finland, Germany, Belgium, Czech Republic, Italy, Norway), EUR-B (Armenia, Georgia, Slovakia, Turkey) and EUR-C (Belarus, Estonia, the Republic of Moldova, Hungary)⁴.

⁴ The division in subregions based on mortality was first used in the 2002 World Health Report. For a detailed discussion on the methodology applied, see URL: accessed 20 May 2010

Figure 1 Countries that responded to the questionnaire



The original questions of the questionnaire together with the responses are summarized below.

Legal aspects of water-related disease surveillance

International Health Regulations

The International Health Regulations⁵, the legally binding agreement to prevent the international spread of disease, were revised in 1969, then in May 2005. The 2005 revision of the Regulations entered into force on 15 June 2007. The IHR(2005) apply to any diseases (including those from new or unknown causes) irrespective of point of origin, that could present significant harm to humans. Adopted at the Fifty-eight World Health Assembly in Geneva in May 2005, the IHR(2005) are binding obligations upon 194 countries under international law.

A fundamental innovation in the new legal public health framework is the mandatory obligation of all States Parties to develop, strengthen and maintain core public health capacities for surveillance and response, as soon as possible. The IHR(2005) set out a two-phase process to assist State parties to plan for the implementation of their capacity strengthening obligations:

Phase 1: 15 June 2007 – 15 June 2009

By 15 June 2009, States Parties must assess the ability of their existing national public health structures and resources to meet the core surveillance and response capacity requirements described in Annex 1A of the IHR(2005). Following this assessment, States Parties are required to develop national action plans to ensure that these core capacities are present and functioning throughout the country. WHO will support these assessments and provide guidance on the content and structure of national plans.

Phase 2: 15 June 2007 – 15 June 2012

By 15 June, the surveillance and response capacities set out in Annex 1A are expected to be implemented by each State Party.

Protocol on Water and Health

Parties under the Protocol on Water and Health are obliged under Article 8 “Response systems” § 1 to ensure that

- (a) Comprehensive national and/or local surveillance and early-warning systems are established, improved or maintained which will:
 - i. Identify outbreaks or incidents of water-related disease or significant threats of such outbreaks or incidents, including those resulting from water-pollution incidents or extreme weather events
 - ii. Give prompt and clear notification to the relevant public authorities about such outbreaks, incidents or threats

⁵ Anon. (2008) International health regulations WHO Geneva available from URL: http://whqlibdoc.who.int/publications/2008/9789241580410_eng.pdf accessed 10 December 2009

- iii. [...]
- iv. Make recommendations to the relevant public authorities and, where appropriate, to the public about preventative and remedial actions

Furthermore, Article 7 “Review and Assessment of Progress” § 1 obliges Parties to collect and evaluate data on indicators that re designed to show how far that progress has contributed towards preventing, controlling or reducing water-related disease.

Sub-regional legal instruments

Countries that have ratified the Protocol on Water and Health and are member of the European Union have additional legal obligations concerning the surveillance of water-related diseases, particularly under Decision 2119/98/EC⁶ and Decision 2000/96/EC⁷

There was, therefore, a sound legal basis to undertake the assessment reported in this paper as the outcome will assist countries in meeting their obligations under the IHR(2005) and under the Protocol on Water and Health, as well as facilitating compliance with the sub-regional legislation of the *acquis communautaire* under the European Union.

General aspects on surveillance systems on communicable diseases

All the 15 countries have a mandatory surveillance system on communicable diseases, where all the *priority WRDs* are generally surveyed. Only enterohaemorrhagic *E. coli* is not surveyed in two EUR-A countries. Emerging WRDs appear to be considered less of a priority in some of the respondent countries. Indeed one country of EUR-A and one of EUR-C do not consider at all these diseases in their surveillance systems. Two countries (in EUR-A and EUR-B) do not include enteric protozoa in their surveillance systems.

More specifically, the following emerging WRDs are not surveyed:

- Campylobacteriosis in two countries (in EUR-A and EUR-CC);
- Cryptosporidiosis in six countries (four in EUR-A, one in EUR-B and one in EUR-C);
- Giardiasis in four countries (two in EUR-A, one in EUR-B and one in EUR-C);
- Legionellosis in one EUR-C.

⁶ Decision 2119/98/EC of the European Parliament and of the Council of 24 September 1998 on the setting up a network for the epidemiological surveillance and control of communicable diseases in the Community. Links to the Decision and amending acts at URL: http://europa.eu/legislation_summaries/public_health/threats_to_health/c11548b_en.htm accessed 11 December 2009

⁷ Commission Decision 2000/96/EC of 22 December 1999 on the communicable diseases to be progressively covered by the Community network under Decision No 2119/98/EC of the European Parliament and of the Council *OJ L 28/50 03.02.2000* accessible through URL: http://ec.europa.eu/health/ph_threats/com/comm_legislation_en.htm accessed 11 December 2009

Locally important WRDs, as expected, are surveyed in countries where they are locally relevant (especially because of their endemic occurrence or high concentrations in natural waters used for drinking):

- Methaemoglobinaemia (blue-baby syndrome) in two countries of EUR-B and EUR-C (in another country of this latter subregion this surveillance is in preparation in another country);
- Arsenicosis in one EUR-B country;
- Viral infections, particularly norovirus, in seven countries (three from EUR-A, one from EUR-B and three from EUR-C);
- Parasitic diseases in three EUR-A, two EUR-B and three EUR-C countries; (their surveillance is in preparation in another EUR-C country).

Surveillance: Structure, coordination and reporting.

All the countries have dedicated, mandatory WRD surveillance systems, with the exceptions of two EUR-A countries.

Twelve countries replied to this question.

The following is a brief description of the reported surveillance systems.

It should be recorded that, after a first elaboration of a draft summary report, the findings were sent back to the representatives of the countries concerned with a request to mark their disagreements if any. No expression of disagreement was received by the authors from the governments concerned.

Countries of EUR-A subregion

The following points hold for all EUR-A countries that responded to the questionnaire

1. Three communities have the responsibility of the compilation and delivery of data to the Health Inspector of their Province. The three lists of diseases differ, but many of them are common. The Scientific Institute of Public Health or similar national institute centralizes data and runs several voluntary surveillance systems involving a sentinel lab network and some reference labs (e.g., salmonella, shigella) and reports internationally.
2. Municipal health protection authorities are obliged to report all suspected WRDs outbreaks to the National Public Health Institute that coordinates the analytical and epidemiological activities in order to face the outbreak.
3. The surveillance system is centralized, with national laboratory (nevertheless almost all the samples are sent abroad to reference laboratories for analysis).
4. Local hospitals (clinics) and laboratories are obliged to report in a given format the occurrence of any case of infectious disease listed in the national decree to the Local Public Health Authority (Dept. of Epidemiology). This authority makes more detailed investigations if necessary, at a minimum for the selected diseases listed in the national legislation. Cases are recorded electronically.

5. Laboratory confirmed cases of infectious diseases are notified by laboratories and physicians at the national level. Outbreaks are locally investigated.
6. The starting point of the surveillance system is represented by the notification of any new cases of communicable diseases, even if only suspected, by the physicians to the Local Health Units of the National Health System. All these Units are responsible for preparing and sending out case reports every month to the Regional Health Authority, which in turn is responsible for forwarding them to the Ministry of Health. The reporting form used in the formal notification indicates the results of the accomplished investigations, with regards to etiological agents, incubation time, duration of the illness, history of the exposed persons and identified or supposed sources of exposure, water included.

Countries of the EUR-B Subregion

- 1 The surveillance system is coordinated by the departments of epidemiology within several Public Health Authorities at the regional level, led by the national Public Health Authority. Health care providers and health care professionals as well as clinical laboratories are obliged to report confirmed or suspected cases of infectious diseases at the regional level. The reports are sent to the central register for infectious diseases. An early response warning system has also been set up. Outbreaks and cases of infectious diseases are reported immediately. A summary of the information about epidemiological situation for the competent district is elaborated each week at central level. An informative webpage for professionals as well as for the public is available weekly, monthly, annually, with graphical and map illustrations.
2. Inspectorate centres ensure the implementation of provisions defined in governmental resolutions and legal acts. They conduct controls, take administrative proceedings, investigate and apply adequate penalties. Inspectorate centres receive notifications of cases of infections, coordinate epidemiological investigations, identify sources of infection, develop and introduce measures. They also monitor the quality of drinking-water.
3. At the central level, a “National Centre for Disease Control and Prevention and Public Health”, provides statistical data on mortality and morbidity, including data and diseases associated with water. There is a role of the World Bank in providing and improving mobile and local laboratories also for monitoring surface waters used for recreational activities. Regional and local centres of public health and diagnostic laboratories are part of this system. Regional and local public health centres survey infectious and non-infectious diseases, and develop and implement anti-epidemic measures. Information is delivered to the relevant services of local authorities and is transmitted to the central authorities: Ministry of Labour, Health and Social Welfare, National Service of Food Safety, Veterinary and Plant Protection Department of Agriculture (Safety of drinking-water), and in case of emergencies to the Ministry of Environment and Natural Resources and the Ministry of Interior.

Countries of the EUR-C Subregion

1. Cases of disease caused by particular microbiological agents and gastroenteritis of unspecified origin, as well as outbreaks of water-related diseases, are reported by health care workers to the local or regional level of the National Public Health and Medical Officers' Service. A national electronic system provides online connection amid the three

levels (local, regional and national) of the organization. There is a legally binding monitoring system for central and local community drinking-water systems and for pool and spa water systems, as well as for natural bathing waters. An indirect support to the water-related diseases surveillance system is ensured due to the identification of high concentrations of microbiological indicators during monitoring activities of these waters.

The surveillance system has three levels: community, municipality and national level. An emergency notification system for epidemic-prone disease is functioning. A case notification form is filled out on individual cases and is sent within 24 hours to the district Centre of preventive medicine. Each outpatient case has to be notified, first by phone. During epidemic outbreaks aggregated notifications of communicable disease cases are used instead of individual notification forms. Data are recorded at the level of the centre of preventive care that is also responsible for laboratory investigations, control measures and final diagnosis. All cases matching outbreak/emergency definitions are to be reported to the Ministry of Health within 12 hours through a dedicated phone line.

2. Primary recording of infectious and parasitic diseases (including water-related diseases) is carried out in medical documentation of territorial patient care and prophylactic institutions; then it is sent to the territorial Centre of Hygiene and Epidemiology by telephone followed by a standardized written form. On the base of analysed information, the personnel of these centres fills a standardized form that includes information on a) source of infection and transmission factor, b) sanitary-hygienic characteristics of local hotbeds related to the patient. Information on every confirmed case of a disease that is subject to mandatory registration is recorded in an electronic database that provides monthly and annual comparative analysis of sickness rates. Monthly and annual statistical reports are sent by the territorial (district, city's, zonal) Centres of Hygiene and Epidemiology to the Regional and Republican Centre of Hygiene and Epidemiology, to the Ministry of Health, and hence to the National Statistics Committee.

Conclusion on surveillance structure

In conclusion, all countries but one (from EUR-A), have a coordinating body at national level that elaborates standardized surveillance notification forms to gather communicable disease surveillance data.

Five countries (Three from EUR-A, one from EUR-B and one from EUR-C) do not have specific mandatory reporting forms for WRDs. In addition, this notification forms does not include the possible vehicle of infection (water, foods, etc) and the environmental sources. In a country from EUR-C the notification form of emerging diseases does not include environmental sources. The notification forms of a EUR-A country do not consider environmental sources responsible for water contamination in cases of diseases caused by *Cryptosporidium* and *Giardia*.

All countries with the exception of one in the EUR-A region, have a coordinating body at national level.

In all countries (except one of the EUR-A subregion) standardized surveillance notification forms are provided by the central level to collect data on communicable diseases.

The possible vehicle of infection (water, foods, etc) is not considered in the notification forms in three EUR-A, one EUR-B and one EUR-C countries.

Later confirmation of the exposure route is not envisaged in specific reporting forms in five countries (two from EUR-A, one from EUR-B and two from EUR-C).

The potential environmental sources responsible for WRDs are not considered at all in the notification forms in five countries (three from EUR-A, one from EUR-B and one from EUR-C). One country in the EUR-B region does not investigate environmental sources that may be responsible for emerging diseases and one country in the WHO Regional Office for Europe-A region does not investigate environmental sources that are responsible for parasitic diseases.

Case confirmation

Case confirmation by laboratory analysis is mandatory in several countries, with the following exceptions: two EUR-A countries for any WRDs; one country in EUR-C for *Shigella*; one country in EUR-A for *Cryptosporidium* and *Giardia*; one country in the EUR-B region for *Campylobacter*, *Cryptosporidium*, *Giardia* and *Legionella*.

In general a national laboratory capability to confirm the etiological agents does exist with the following exceptions: one country in EUR-C for any WRDs; one country in EUR-A for cholera, enterohemorrhagic *E. Coli*, shigellosis, typhoid fever and all emerging WRDs; one country in EUR-B for *hepatitis A* and all emerging pathogens; another country from EUR-B has laboratory capability only for legionellosis.

The etiological agents responsible for priority WRDs are generally detected by routine laboratory analysis in ten countries: 5 from EUR-A, 3 from EUR-C, and 2 from EUR-B, with the following exceptions: all the etiological agents in one country of EUR-A; *Hepatitis A* viruses in one country from EUR-B and one of EUR-C; enterohaemorrhagic *Escherichia coli* in one country from EUR-A and one from EUR-B; *Salmonella typhi* and *Salmonella paratyphi* in one EUR-A country.

The etiological agents responsible for emerging WRDs are detected by routine laboratory analysis in three countries (two from EUR-B and one from EUR-A). The following are not detected: any *Campylobacter* species neither *Legionella pneumophila* in one EUR-B country. *Cryptosporidiosis parvum* and *Giardia lamblia/ G. duodenalis* in two countries from EUR-A and EUR-B; *Campylobacter* in one EUR-C country, One country in the EUR-A subregion detects only *Legionella*.

Public information

Legal basis

Article 10 on Public Information obliges Parties to the Protocol on Water and Health to take steps within the framework of its legislation

to make available to the public such information as is held by public authorities and is reasonably needed to inform public discussion of:

- a. The establishment of targets and of target dates for their achievement and the development of water-management plans in accordance with article 6
- b. The establishment, improvement or maintenance of surveillance and early warning systems and contingency plans in accordance with article 8
- c. The promotion of public awareness, education, training, research, development, and information in accordance with article 9.

Furthermore, the vast majority of the Parties to the Protocol are also Party to the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (the Aarhus Convention).

The legal obligations of the Parties to facilitate and further promote public information and public participation prompted further investigation as to their capacity to inform and involve the public.

Findings

Seven countries from EUR-A have a public awareness programme on the importance of water-related diseases and the relationship between water hygiene and health.

Ten countries have an integrated information system: accessible to the public, about long-term trends, current concerns and successfully handled past problems in water and health six from EUR-A, one from EUR-B and three from EUR-C.

Five countries from EUR-A, one from EUR-B and three from EUR-C do not have an information system on rights and entitlements to water.

Six countries have dedicated web sites: one from EUR-A, four from EUR-B and one from EUR-C. One country from EUR-B also provides further information to the public, such as

- a) Awareness programme on the importance of WRDs in the formal education system – in subject “environmental education”.
- b) Activities for the public such as World Water Day;
- c) Cooperation with the Public Health Authority to publish weekly reports concerning infections of environmental origin;
- d) Annual reports in the area of health and the environment;
- e) Reports on trends in water and health problems;
- f) Annual reports on drinking-water

Data characteristics

Case information (age, sex and occupation) is requested in the notification form:

- Fully in five countries (four from EUR-A, and one from EUR-B and EUR-C).
- Almost completely in four countries (two from EUR-A, one from EUR-B and one from EUR-C)
- Lower or much lower in other four countries (one each from EUR-A and EUR-B and two from EUR-C).

Location information (district, region, municipality, travel-related) is requested in the notification form:

- Fully in three countries (one per subregion).
- Partially in other countries.
- At all in one country of EUR-A.
- Other information (outbreaks, time, sentinel) is requested in the notification form:
- Fully in one country from EUR-C
- Partially in other countries.

Basic statistics and trend analysis are performed by many countries but not in two (one from EUR-A and one from EUR-B).

One country from the EUR-C region does not perform statistical analysis for enterohaemorrhagic *E. coli* while three countries (one from the EUR-C and two from EUR-B) for any emerging diseases.

Generally all the countries have established action threshold for WRDs.

- For some severe diseases like cholera and typhoid fever this value is generally of 1 case.
- In some countries this value is of 2 cases.
- The highest reported number is of 10 in the case of hepatitis A in a country from EUR-C.

Outbreak detection

In centralized water supply systems, drinking-water as exposure route of priority WRD pathogens is generally identified. This source of exposure is not investigated: in three countries from EUR-A and one from EUR-B; in two countries from EUR-B and two from EUR-C when cases of *viral hepatitis A* occur.

Two countries from EUR-B and EUR-C do not identify the exposure route for any emerging WRDs

In small-scale community, private and unregulated water supply systems:

Priority diseases: drinking-water as exposure route is identified:

- in one country from EUR-A and one from EUR-B for all priority WRDs;
- in seven countries (one from EUR-A, two from EUR-B and four from EUR-C) partially;
- in two countries (one from EUR-A and one from EUR-B) at all..

Emerging diseases: this exposure route is identified:

- fully in two countries (one from EUR-A and one from EUR-B);
- partially in some other countries;
- not at all in five countries (three from EUR-A, one from EUR-B region and one from EUR-C).

Food resulting from aquaculture (shellfish, clams, mussels) when suspected as possible cause of WRDs is investigated:

- fully in three countries (two from EUR- A and one from EUR-C);
- sometimes in two countries (one from EUR-B and one from EUR-C);
- not at all in four countries (two from EUR-A, one from EUR-B and EUR-C).
- Irrigated agriculture products: are investigated:
- fully in two countries (one from EUR-B and EUR-C);
- occasionally in four countries (one from EUR-A, two from EUR-B and one from EUR-C);
- not at all in five countries (two from EUR-A and EUR-B and one from EUR-C).

Recreational water is identified:

- fully in two of EUR-A and one of EUR-B;
- almost completely in other two countries of EUR-C, with the exception of *hepatitis A*;
- at all in four countries (three from EUR-A and one from EUR-B);
- occasionally in four countries (two from EUR-B and two from EUR-C).

Epidemic preparedness

Epidemic preparedness and response plans for outbreak of water-related diseases are not available at all in seven countries (three from EUR-A, one from EUR-B and two from EUR-C regions); three countries (two from EUR-B and one from EUR-C region) elaborate these plans for priority WRDs.

During the last year, emergency supply of drugs was available:

- in seven countries (two from EUR-A, four from EUR-B and one from EUR-C region);
- partially in one country from EUR-A (to treat giardiasis and legionellosis);

- not at all in one country from EUR-A and one from EUR-C for hepatitis A.

Emergency supply of vaccines were available during the last year:

- in three countries from EUR-A and one from EUR-C to prevent hepatitis A;
- in one country from EUR-A and one from EUR-C to prevent typhoid fever;
- not at all for any in one country from EUR-A, two countries from EUR-B and one from EUR-C.

Emergency medical supplies were available during the last year:

- at all in one country from EUR A, one from EUR-B and two from the EUR-C region;
- partially in one country from EUR-A for treating viral hepatitis A.
- In the last year, emergency water treatment supplies was available during the last year:
- at all in two countries from EUR-A, one from EUR-B and one from EUR-C (excluding cholera);
- partially in one country from EUR-C (not available for emerging pathogens).

Information related to emergency outbreaks is not adequately provided to the public, in five countries (three from the EUR-A and two from the EUR-C region).

Also, response plans related to WRD outbreak are not adequately provided to the public in most countries (five from the EUR-A, two from the EUR-B, and four from the EUR-C).

Response capacity

Almost all countries are capable of starting intervention measures within 48 hours from notification; one country from EUR-C has an organization that ensures intervention measures within 4-5 days after notification in case of giardiasis outbreak.

Training

Periodic training courses on surveillance systems are performed in all the countries with two exceptions (one from the EUR-A and one from the EUR-B region).

Nevertheless, WRD are not addressed by the training courses five countries (four from the EUR-A and one from the EUR-B).

One country from the EUR-A and one from the EUR-C region would appreciate international support for such training courses;

Another country from the EUR-C has specifically underlined the need of support in training courses on methods and financial aspects;

Databases and Mapping/GIS Resources

Central computerized database for cases and outbreaks of WRDs are available in some countries but not in five (four from the EUR-A and one from the EUR-B region).

Geographical Information System (GIS) is partially used in 9 countries (three from the EUR-A, EUR-B and EUR-C regions) but not in two countries from the EUR-A and one country from the EUR-C region. GIS use in the sector of communicable diseases is ongoing in one EUR-A country.

GIS courses are foreseen in four countries (one from the EUR-A and EUR-B regions, and two from the EUR-C region).

Discussion and conclusion

The authors recognize that, notwithstanding every effort to make this a regional study, the final result still has some important limitations:

- The number of respondents is rather limited; in view of the significant sub-regional differences in the performance of national health systems, the findings are more indicative of the situation than truly representative for the entire region.
- We do recognize that respondents were often the central focal points, working on the basis of readily available information, but who may not have possessed specialised epidemiological knowledge.
- The questionnaire covers 10 different and heterogeneous sections; hence it is possible that at least in some of these sections the information provided is not exhaustive. Another problem is that of elaborating national syntheses extrapolating from often very heterogeneous situations in every country in the organization of the surveillance systems on WRDs, notification at central level, etc.

In spite of these and possibly other limits, we do believe that the information gathered provides useful indications on the surveillance systems on WRDs in the European UNECE/WHO Region and allows to identify the main gaps needed to be bridged for their improvement.

From the analysis of the replies, it seems possible to underline the following.

1. Priority WRDs are generally surveyed in all the countries of the three UNECE/WHO subregions. Emerging WRDs are less considered and as expected, locally important WRDs are monitored in few countries, denoting their endemic features and possibly diverse country capabilities.
2. All the countries have dedicated, mandatory WRD surveillance systems, with two exceptions from the EUR-A region. There are different organizations in the surveillance system structure but generally they include a central coordination body (Ministry of Health or other Ministries or in public Institutes of Health or Epidemiology), regional (district) and local structures. A standardized notification form to report outbreaks is generally mandatory. Hospitals, physicians and clinical laboratories generally compile and send out notifications of cases and outbreaks of WRDs. Sometimes these notifications are also provided by a sentinel lab network. Generally the cooperation among the diverse institutional actors (environment, health, water management, etc.) is scarce, with some exceptions where the cooperation is excellent. In one country from the EUR-B region, the necessary integration of activities is ensured by the national government through the adoption of specific decisions that identifies tasks for relevant cooperative sectors.

3. With few exceptions, case confirmation by laboratory analysis is generally mandatory, especially for etiological agents responsible for priority diseases. Nevertheless, some countries do not have or have poor capability to confirm WRDs (especially emerging diseases) by national laboratories. The etiological agents responsible for priority WRDs are generally detected by routine laboratory analyses, yet, some important etiological agents are not detected in some countries. The etiological agents responsible for emerging WRDs are detected by routine laboratory analysis only in few countries.
4. In general, information to the public is weak, with few exceptions.
5. At central level, the details on the main data characteristics on WRD cases and outbreaks are scarce in most of the countries. Drinking-water is identified as route/vehicle of WRD transmission by most of the countries in cases of priority WRDs due to contamination of centralized water supplies. This route/vehicle is less investigated, and especially for emerging WRDs, in cases of small-scale, community, private and unregulated water supply systems. Rarely indirect routes of WRDs, such as aquaculture (shellfish, clams, mussels) and irrigated agriculture products are investigated. Finally, few countries consider, hence investigate bathing waters as possible route of WRDs.
6. The capability of detection of WRDs seems poor especially with reference to drinking-water in small communities and rural areas; aquaculture and irrigated crops; recreational activities.
7. Surprisingly, respondents stated, and their replies were not challenged by the governments concerned, that epidemic preparedness is not available at all in 7 countries and is ready only for priority WRDs in 3 countries. Nevertheless, we feel that this statement needs further inquiry.
8. Like Epidemic preparedness, Response plans are not available at all in 7 countries and are ready only for priority WRDs in 3 countries. Scarce is the use of drugs to face WRD outbreaks. Several countries do not stock emergency water treatment supplies for possible uses during WRD outbreaks. Information related to emergencies and response plans are not adequately provided to the public in most of the countries.
9. Most of the countries do not organize training courses on WRDs. Three countries consider international support needed for training courses on WRDs.
10. Computerized database for cases and outbreaks of WRDs are not available in 5 countries and GIS is not used at all in 3 countries and partially in 9 countries. GIS courses are foreseen in 4 countries.

In general it is not possible to observe important differences between the three European subregions.

From the received information it is possible to conclude that the fifteen countries that replied to the questionnaire are characterized by a high heterogeneity in their surveillance and early warning systems on WRDs. It seems also possible to provide some specific recommendations, as:

- it seems necessary that countries do control all priority WRDs (e.g., Enterohemorrhagic *E.coli*) and improve their capability of surveillance of emerging and locally important WRDs;
- some countries should improve their surveillance systems and promote a better integration of activities between different institutional actors (for example, instituting

local “Outbreak Management Team”, with representatives of local health unit, environmental agency, waterworks, etc.);

- laboratory capability should ensure the identification of etiological agents responsible for outbreaks and cases of WRDs. This activity is crucial for the phase of preparedness and possibly prevention;
- the public has precise rights to receive a correct, complete, transparent information. Public authorities should also provide an adequate base of education in order to increase their capability to manage emergency situations, for instance learning the use of simple household treatment techniques (ceramic filters, boiled water, etc.);
- special attention should be paid in the preparation of the notification form, that should include all the information necessary for an adequate, possibly complete description of the case/outbreak of WRDs (possible vehicle of infection; later confirmation of the exposure route; potential environmental sources responsible for water contamination, case information (age, sex and occupation); location information (district, region, municipality, travel-related);
- outbreak detection should improve in rural areas, small communities, for diseases associated with exposure to pathogenic microorganisms during recreational activities or due to ingestion of aquatic animals or irrigated crops;
- epidemic preparedness should be planned in all the countries, where adequate uses of emergency drugs, vaccines, medical and water treatment supplies should be foreseen; the public should receive proper information, from this point of view it is noteworthy mentioning that many diseases have a clear seasonability and that a considerable percentage of outbreaks caused by exposure to contaminated water occur after floods or heavy rains (Naumova, 2006). Information from labs that routinely monitor the quality of water should be promptly provided to the surveillance system when microbiological indicators show high increases of their concentrations. All this information might be even better used, of course, for preventive purposes;
- capacity of response should be rapid in order to reduce the spread of the outbreak, identify and isolate the source of infection, promote the necessary management actions and investigations;
- of course, a central computerized database for cases and outbreaks of WRDs is advisable as well as the use of GIS;
- training courses on surveillance systems specifically addressed to WRDs should be promoted; for some countries a proper international support is strongly requested and suggested.

Strengthening the health systems by addressing the possible areas of improvement identified under the present study would not only contribute significantly to the implementation of the Protocol on Water and Health. Better surveillance systems, coupled with better communication efforts, would also make an essential contribution to the realisation of the UNECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention) in particular Art 5 par. 1 (c)

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