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Detection of a high-endemic focus of *Echinococcus multilocularis* in red foxes in southern Denmark, January 2013

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The Danish surveillance programme for *Echinococcus multilocularis* was initiated in September 2011, and so far 679 wild carnivores have been examined. In April 2012, one infected fox was detected in Højer near the Danish-German border, and in January 2013 three additional foxes from the same area were found infected. Local prevalence in the area was 31% (four of 13 foxes) which is a new epidemiological situation calling for re-evaluation of the national risk management.

As part of the surveillance for the fox tapeworm *Echinococcus multilocularis*, one red fox (*Vulpes vulpes*) was found positive in April 2012. The animal had been shot in November 2011 in the Højer area, Jutland in the southern part of Denmark, less than 10 km north of the border between Denmark and Germany [1]. In January 2013, *E. multilocularis* was detected in a further three foxes, one had been shot in September 2012, the other two in November 2012. A total of 13 foxes from this location have been examined corresponding to a local prevalence of 31% (95% confidence interval (CI): 7–55) in foxes. These were the first findings of *E. multilocularis* in mainland Denmark.

Background

E. multilocularis is endemic in large parts of Europe, and has been detected with increasing prevalence and geographical spread during the last decades, including in countries bordering Denmark, such as Germany [2], the Baltic States [3], and most recently Sweden [4]. Humans may be accidental intermediate hosts and develop alveolar echinococcosis , one of the most severe zoonotic infections in the northern hemisphere. Infections in humans are rare but cause considerable public health concern due to treatment costs and high mortality if left untreated [5]. In Denmark, infection with *E. multilocularis* is notifiable in all animal species, but not for human cases.

E. multilocularis was discovered for the first time in Denmark in 2000 in three of 1,040 foxes (0.3%). However, all infected foxes were from the Copenhagen area (Zealand) which corresponds to a local prevalence of 0.9% (three of 340 foxes) [6]. No additional national surveillance has been conducted in wild carnivores, but one of 169 clinical samples from domestic Danish cats, submitted to a diagnostic German laboratory for routine analyses in 2004–05, was found positive [7].

Surveillance of *Echinococcus multilocularis* in wild carnivores, 2011-13

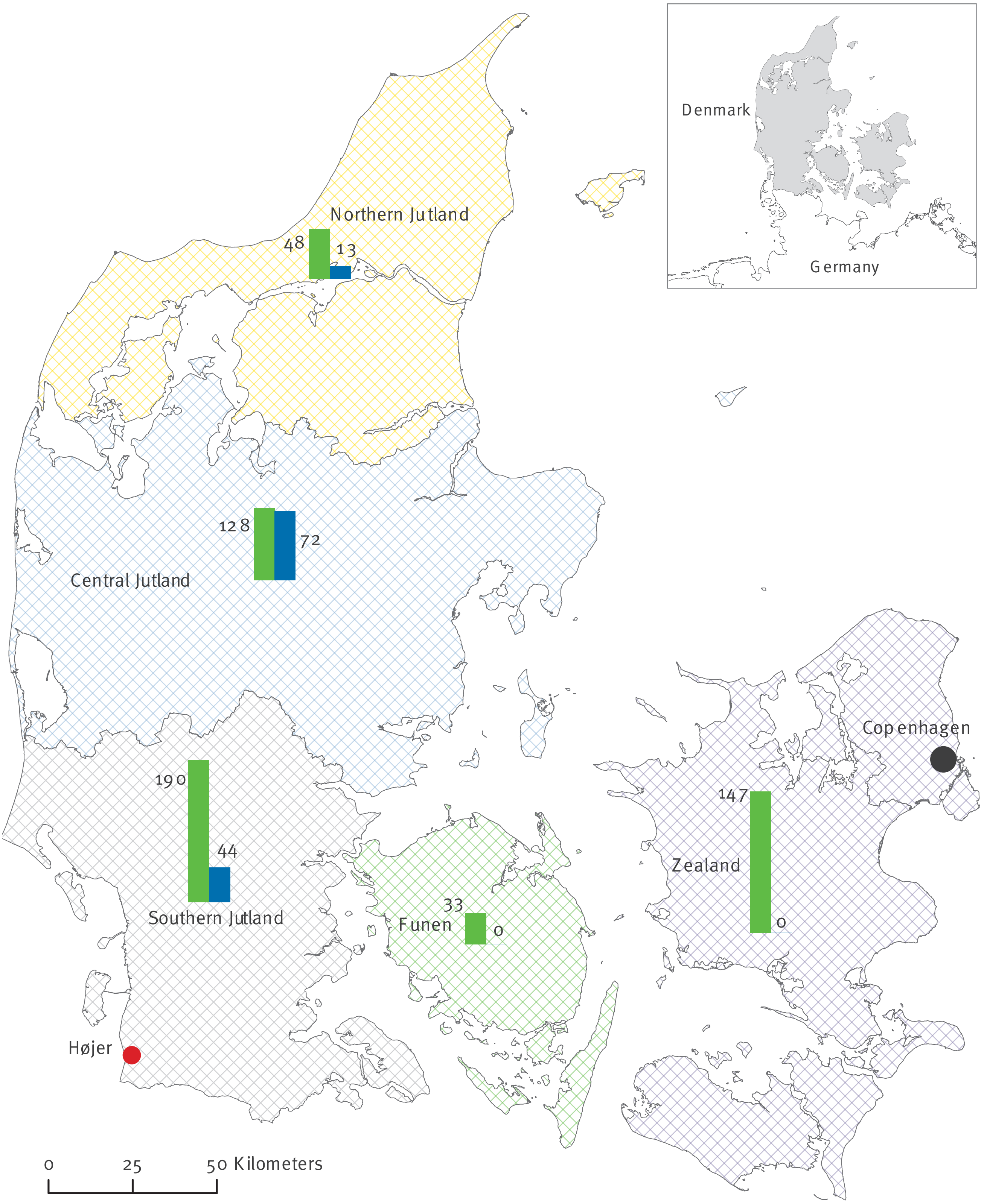
Following the detection of *E. multilocularis* in a Swedish fox in 2011 [4], a surveillance programme for Echinococcus in wild carnivores was initiated in Denmark in September 2011. Included in the surveillance were road-killed and hunted animals collected by the Danish Nature Agency or by voluntary hunters. To date, a total of 679 wild carnivores, namely 546 foxes, 129 racoon dogs (*Nyctereutes procyonoides*), three badgers (*Meles meles*) and one wolf (*Canis lupus*), have been examined by the sedimentation and counting technique [8]. The geographical origin of the tested foxes and raccoon dogs is shown in Figure 1.

The first positive fox was shot in November 2011 in Jutland close to the village Højer, 8 km north of the border to Germany (Figure 1), and tested positive in April 2012. The fox was an adult male harbouring 20 adult tapeworms. In addition to morphological identification, these worms were analysed by PCR amplification and sequencing of the 12S rRNA gene [9], revealing a 200 bp product that was 100% identical to *E. multilocularis* sequences in GenBank, e.g. JX068642. Subgenotyping by fragment size analysis of the EmsB microsatellite marker [10] was done to compare the genetic profile with other European isolates (Figure 2). The results revealed no close relationship to other isolates analysed so far.

In January 2013, three additional foxes from the same area, shot within a radius of 10 km, were detected positive for *E. multilocularis* by the sedimentation and

Figure 1

Geographical distribution of all foxes and raccoon dogs analysed as part of the Danish *Echinococcus multilocularis* monitoring programme, September 2011–January 2013 (n=675)



Green bars: foxes. Blue bars: racoon dogs.

The red circle in the bottom left corner of the map indicates the area where four infected foxes were shot from November 2011 to November 2012.

counting technique. These foxes, all adult females, were shot in September and November 2012, and harboured two, seven and 27 adult tapeworms, respectively. Molecular analysis of these worms is ongoing. Until now a total of 13 foxes (of which four were positive) and three racoon dogs (all negative) from this area have been examined for infection with *E. multilocularis* corresponding to a local prevalence of 31% (95% confidence interval (CI): 7–55) in foxes. Based on the preliminary surveillance data, the countrywide prevalence of *E. multilocularis* is 0.7%. So far infection with *E. multilocularis* has not been detected in wild carnivores other than foxes in Denmark.

Discussion

The Danish *E. multilocularis* isolate did not cluster closely with any other European isolates of fox origin sub-genotyped until now. Hence, introduction from neighbouring countries cannot be documented on the present basis.

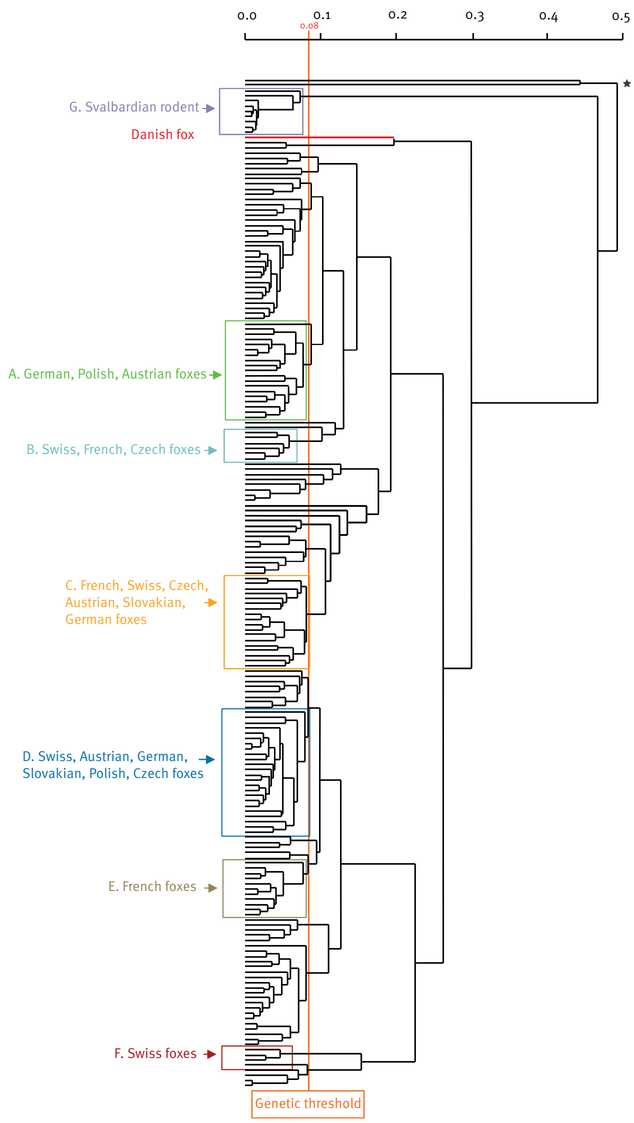
E. multilocularis was first detected in Denmark more than a decade ago [6], but has never before been detected outside Zealand. However, as no surveillance was in place, the parasite may not have been detected. The temperate climate of Denmark allows the survival of *E. multilocularis* eggs for extended periods, and rodents, implicated as intermediate hosts of the parasite in other European countries, are prevalent [11]. Thus, conditions for the establishment and spread of infection are present, although alveolar echinococcosis in intermediate and aberrant hosts has not yet been detected, and there is no information on any autochthonous human cases.

The samples collected for the present study were representative of the whole country. Nevertheless, the current prevalence of *E. multilocularis* in Danish wildlife is based on analyses of a relatively low number of samples and it is therefore too early to conclude whether there is a general increase in the prevalence on a national level. Even in low-endemic regions, local foci with high prevalence of *E. multilocularis* in foxes are known [12,13]. A consistently high prevalence of 35-65% of *E. multilocularis* has been registered in foxes in endemic European countries, where human cases appear, and foxes are believed to be responsible for most of the environmental contamination with *E. multilocularis* eggs [14]. Thus, a local prevalence of over 30% in foxes is worrying, and even if based on a small number of foxes, poses an increased risk of transmission to humans as well as dogs and cats. On this background the Danish Veterinary and Food Administration has recommended since 18 February 2013 that dogs in Tønder municipality (i.e. southern Denmark) that are allowed to roam freely in the countryside (including hunting dogs), are dewormed regularly with praziquantel every fourth week.

Due to the long incubation time of alveolar echinococcosis, an increased prevalence of *E. multilocularis* in the fox population will not immediately be reflected

Figure 2

Dendrogram of euclidean distance amongst *Echinococcus multilocularis* worms from foxes in Austria, the Czech Republic, Denmark, France, Germany, Poland, Slovakia and Switzerland, and rodents form Svalbard (Norway) (n=193 + two out-group samples)



Out-group samples (*Echinococcus granulosus*) are marked with a star. Samples with a genetic distance › 0.08 are considered as different. Groups A to D are examples of multi-origin clusters and groups E to G are single-origin clusters.

in an increased incidence of alveolar echinococcosis among humans [8]. However, as alveolar echinococcosis spreads in a tumour-like manner it can be misdiagnosed as liver cancer. Alveolar echinococcosis should therefore be considered as a differential diagnosis, and may become increasingly important in the future.

Worm burdens detected in Danish foxes so far have been low, which is a diagnostic challenge. On the other hand, fewer worms excrete fewer eggs and these foxes probably do not contaminate the environment as much as foxes with large worm burdens. Nevertheless, a local prevalence of this magnitude emphasised the need for re-evaluating risk management and risk communication in the region, and calls for increased awareness among veterinarians as well as physicians.

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Conflict of interest

None declared.

Authors' contributions

Heidi Enemark was responsible for design and conduction of the study and led the writing of the rapid communication. All authors provided contribution to the manuscript and approved the final version. Mohammad Nafi Al-Sabi performed the sedimentation and counting analyses, Jenny Knapp did the microsatellite sub-genotyping, Marie Staahl was in charge of the PCR analysis, and Mariann Chriel coordinated animal sampling.

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Legionnaires' disease in Europe, 2009-2010

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The surveillance of Legionnaires' disease (LD) in Europe is carried out by the European Legionnaires' Disease Surveillance Network (ELDSNet) and coordinated by the European Centre for Disease Prevention and Control (ECDC). All cases reported in 2009 and 2010 and meeting the European case definition were electronically transmitted to The European Surveillance System (TESSy) database. A total of 5,551 and 6,305 cases were reported by 29 European countries in 2009 and 2010, respectively. The age-standardised rate of all cases was 1.20 per 100,000 inhabitants in 2010, 12% higher than in 2009, which was consistent with the increasing trend observed since 2005. Most of this increase consisted of community-acquired cases reported by France, Germany and the Netherlands with dates of onset in August–September. The exceptionally hot summer of 2010 in some parts of Europe may have played a role in this increase.

Background

Legionnaires' disease (LD) is the severe and sometimes fatal form of an infection with *Legionella* spp. LD is classically described as a severe pneumonia that may be accompanied by systemic symptoms such as fever, diarrhoea, myalgia, impaired renal and liver functions, and delirium. These gram-negative bacteria are found in freshwater environments worldwide and tend to contaminate man-made water systems [1]. Humans are infected by inhalation of aerosols containing legionellae. One species of *Legionella*, *L. pneumophila* is the aetiological agent of approximately 90% of all LD cases. Among the 16 identified serogroups of *L. pneumophila*, *L. pneumophila* serogroup 1 is the most commonly involved (approximately 85% of all LD cases) [1,2]. The surveillance of LD at European level started in 1996 and LD surveillance reports were published every other year from 2000 onwards [3-6]. Since 2010, the surveillance of LD in Europe has been carried out by the European Legionnaires' Disease Surveillance Network (ELDSNet) and coordinated by the European Centre for Disease Prevention and Control (ECDC) in Stockholm, Sweden.

Following a period of steady increase of annually reported cases after implementing surveillance at European level, the number of reported cases of LD seemed to reach a plateau of between 5,500 and 6,000 cases from 2005 to 2009 [7]. Here we present cases reported in the European Union (EU) as well as Iceland and Norway for 2009 and 2010, with a focus on the increase observed in 2010. To put this increase into perspective, the trend observed since 2005 was also analysed.

Methods

ELDSNet comprises all 27 EU Member States, Iceland and Norway. One of the key objectives of the network is the annual collection, analysis, interpretation and communicating of surveillance data on all LD cases reported at national level during the previous year. Each year, nominated ELDSNet members in each of the participating countries are asked to electronically transmit their data to The European Surveillance System (TESSy) database hosted by ECDC. In 2010, when the first data call was made, ELDSNet members were also asked to upload respective historical data since 2005. All cases reported in 2009 and 2010, meeting the EU case definition of confirmed and probable cases, were included in the main analysis [8]. Cases reported since 2005 were included in the trend analysis.

Cases were to be reported as part of a cluster if they had been exposed to the same source as at least one other case with dates of disease onset no more than two years apart. Information retrieved from TESSy included age, sex, date of disease onset, probable setting of infection, laboratory methods used for diagnosis, and clinical outcome. Possible settings of infection were, among others, community-acquired, travel-related and healthcare-associated. Population denominator data for calculating rates were obtained from the Statistical Office of the European Union (Eurostat) [9].

Continuous variables were compared across strata by the Mann-Whitney U test. Categorical variables were compared using the Chi-square or Fisher exact tests. Age-standardised rates (ASR) were calculated using the direct method and the average age structure of the EU population for the period 2000 to 2010.

Table 1

Number, crude and age standardised (ASR) rates of reported confirmed and probable cases of Legionnaires' disease by reporting country, European Union, Iceland and Norway, 2009-2010

Reporting country	2009			2010		
		Rates[a] per 100 000 inhabitants			Rates[b] per 100 000 inhabitants	
	Cases	Crude rate	ASR	Cases	Crude rate	ASR
Austria	92	1.10	1.07	80	0.96	0.91
Belgium	80	0.70	0.68	89	0.82	0.79
Bulgaria	3	0.04	0.04	1	0.01	0.01
Cyprus	3	0.38	0.45	2	0.25	0.32
Czech Republic	18	0.17	0.18	38	0.36	0.35
Denmark	123	2.23	2.24	133	2.40	2.37
Estonia	6	0.45	0.44	0	0.00	0.00
Finland	22	0.41	0.40	24	0.45	0.42
France	1,206	1.87	1.88	1,540	2.38	2.37
Germany	503	0.61	0.55	688	0.84	0.75
Greece	15	0.13	0.13	9	0.08	0.07
Hungary	65	0.65	0.63	60	0.60	0.59
Ireland	7	0.16	0.19	11	0.25	0.31
Italy	1,207	2.01	1.80	1,238	2.05	1.83
Latvia	3	0.13	0.12	6	0.27	0.26
Lithuania	0	0.00	0.00	1	0.03	0.03
Luxembourg	5	1.01	1.08	10	1.99	2.02
Malta	5	1.21	1.25	6	1.45	1.33
the Netherlands	251	1.52	1.53	466	2.81	2.79
Poland	10	0.03	0.02	36	0.09	0.10
Portugal	96	0.89	0.86	128	1.19	1.15
Romania	3	0.01	0.01	1	0.00	0.00
Slovakia	2	0.04	0.04	4	0.07	0.07
Slovenia	66	3.25	3.11	58	2.83	2.68
Spain	1,231	2.68	2.66	1,150	2.48	2.45
Sweden	114	1.23	1.18	100	1.07	1.01
United Kingdom	374	0.61	0.61	376	0.61	0.61
EU 27	**5,510**	**1.10**	**1.07**	**6,255**	**1.25**	**1.20**
Iceland	7	2.20	2.83	2	0.63	0.87
Norway	34	0.70	0.73	48	0.99	1.02
Total	**5,551**	**1.10**	**1.07**	**6,305**	**1.24**	**1.20**

ASR: age standardised rates; EU: European Union.

[a] Information on age available for 5,544 cases in 2009.
[b] Information on age available for 6,293 cases in 2010.

To analyse the trend since 2005, we performed a time series analysis over the 2005 to 2010 period for the five largest reporting countries (France, Germany, Italy, Spain and the United Kingdom). The analysis was limited to these countries because they provided data for the whole period and accounted for a substantial proportion of all cases reported. Weeks of disease onset were analysed for trend (linear regression). Where the information on the exact day of disease onset was not available, it was assumed to be the first day of the month. It was assumed that the population in these countries remained stable over the study period. Statistical analyses were performed using STATA version 11.2 (Statacorp, College Station, TX, USA).

Results

Case classification, notification rate and geographical distribution

Of the 11,856 cases notified over the 2009–10 period, 92% (n=10,960) were confirmed cases, with similar distribution in both years. Eight hundred and

Table 2

Distribution of reported cases of Legionnaires' disease by setting, European Union, Iceland and Norway, 2009-2010

Setting	2009 Cases (%)	2010 Cases (%)	2009-2010 difference (%)
Community-acquired	3,398 (68)	3,999 (71)	+18
Travel-associated	1,055 (21)	1,132 (20)	+7
Travel abroad	523(10)	560 (10)	+7
Domestic travel	532 (11)	572 (10)	+8
Healthcare-associated	471 (9)	424 (8)	-10
Other settings	44 (1)	59 (1)	+34
Total	**4,968 (100)**	**5,614 (100)**	**+13**

ninety-six were probable cases with 24 defined on epidemiological grounds only. The ASR of confirmed and probable cases was 1.20 per 100,000 inhabitants in 2010, 12% higher than in 2009 (1.07 per 100,000) (Table 1). The ASR greatly varied across countries and was highest in Slovenia in 2009 (3.11 per 100,000) and in the Netherlands in 2010 (2.79 per 100,000). The six countries reporting the highest number of cases i.e. France, Germany, Italy, Netherlands, Spain and the United Kingdom, accounted for 86% (n=4,772) and 87% (n=5,458) of all cases reported in 2009 and 2010, respectively. The ASR increase was especially high in the Netherlands (+83%), Germany (+37%) and France (+26%).

Probable setting of infection

For 10,582 cases reported in 2009 and 2010, the probable setting of infection was known. Of these, 71% (n=7,397) were community-acquired, 20% (n=2,187) travel-associated, 8% (n=893) healthcare-related and 1% (n=103) were associated with other settings (Table 2). The distribution of probable settings of infection was similar in both years.

Clusters

Of 7,872 cases with known cluster status, 8% (n=662) were reported as part of a cluster. This proportion was higher in travel-associated cases 20% (284 of 1,399) and lower in community-acquired cases with 5% (259 of 5,015) reported as part of a cluster. This proportion was similar in both years.

Seasonality

Information for date of disease onset was available for 11,305 cases reported in 2009–10; 59% (n=6,702) fell ill between June and October (warm season). This proportion was identical in both years and the same seasonal pattern was observed as in previous years (Figure 1).

Age and sex

Information on age was available for 11,836 cases, of which 43% (n=5,100) were 65 years old or older. Of the 11,849 cases reported with known sex in 2009–10, 73% (n=8,611) were male. Sex ratio was similar in both years. The notification rate increased with age in both sexes and was below 0.1 per 100,000 inhabitants in those under 24 years of age, 0.5 in 25-44 year-olds, 1.9 in 45-64 year-olds and 2.9 in those 65 years of age and older.

Laboratory tests and pathogens

A total of 11,832 confirmed and probable cases were ascertained by 11,976 laboratory tests. Of these tests, 82% (n=9,780) were urinary antigen tests, 10% (n=1,185) were cultures, 5% (n=571) single high titre in specific serum antibody, 2% (n=303) polymerase chain reaction (PCR), 1% (n=141) fourfold titre rise and only 10 tests performed were direct immunofluorescence. The distribution of the tests was similar in both years. Of the 1,166 culture-confirmed cases for which the pathogen was reported, 85% (n=991) were due to *L. pneumophila* serogroup 1 and this proportion was similar in both years.

Outcome

The clinical outcome was known for 8,107 cases, 852 of them died, yielding a case fatality rate (CFR) of 11% which was similar in both years.

Increase of number of cases reported in 2010 compared to the 2008–09 average

Of the 995 excess cases reported in 2010 compared with the 2008–09 average, 67% (n=663) were reported by France, Germany and the Netherlands. Analysis by month of disease onset showed that the largest increases were observed in January (+52%, 148 cases) and August (+50%, 325 cases). Of the 775 excess cases reported in 2010 with known setting of infection, 89% (n=686) were community-acquired. When restricting the analysis to community-acquired cases reported by France, Germany and the Netherlands, the increase was concentrated on January, August and September with a two-fold increase compared to the 2008–09 average in these respective months (Figure 2).

FIGURE 1

Reported cases of Legionnaires' disease by month of onset, European Union, Iceland and Norway, 2010 and 2008-2009 average (n=16,549)

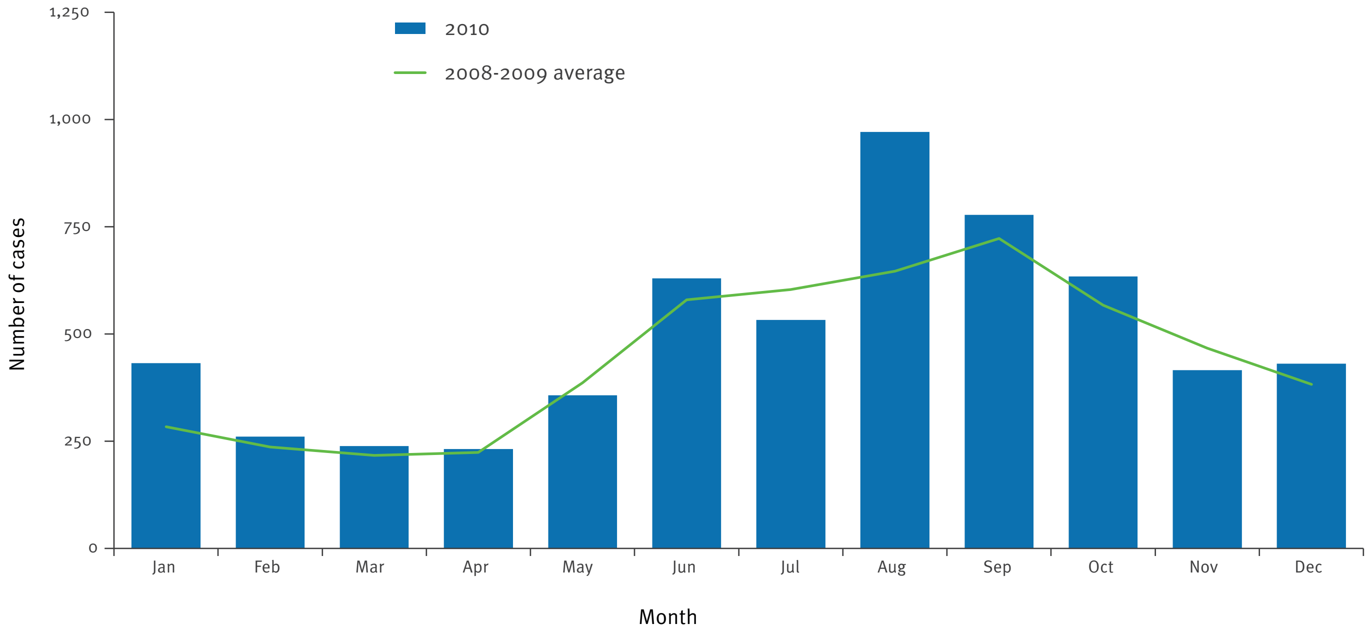


FIGURE 2

Reported cases of community-acquired Legionnaires' disease in France, Germany and the Netherlands by month of disease onset, 2010 and 2008-2009 average (n=3,648)

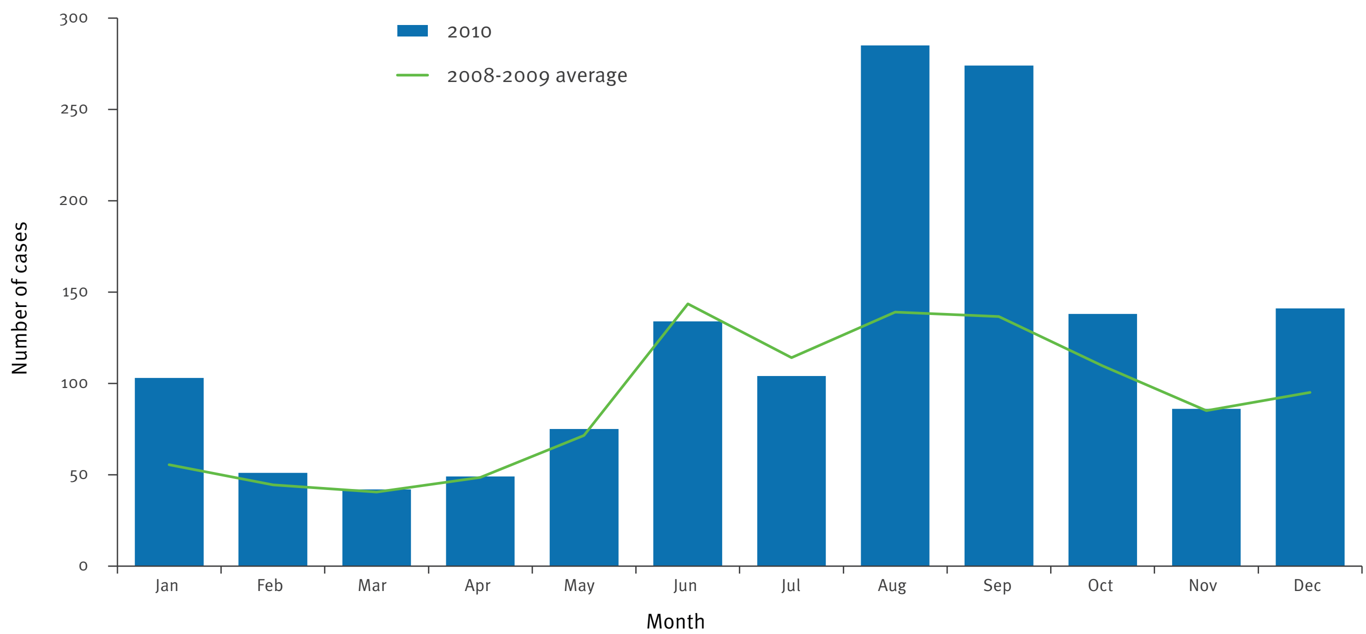
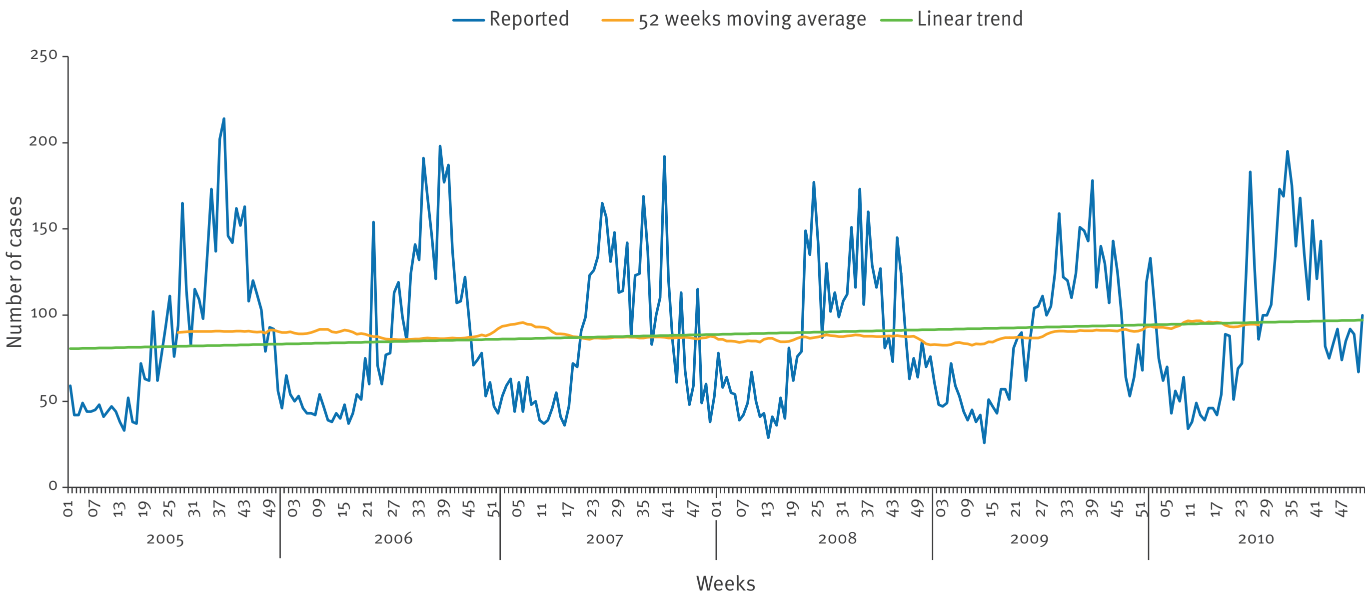


Figure 3

Reported cases of Legionnaires' disease by week of onset, linear trend and 52 weeks moving average, France, Germany, Italy, Spain and the United Kingdom, 2005-2010 (n=27,707)



The increase observed in January was only seen in France. Community-acquired cases reported by France, Germany and the Netherlands did not differ from other cases in terms of age or sex distribution. Cases reported with a date of onset in August and September had a lower CFR as compared to the rest of the year (9 vs. 11%, $p<0.01$) which again was similar in both years.

Time series analysis of Legionnaires' disease cases reported by France, Germany, Italy, Spain and the United-Kingdom, 2005–2010

Of the 32,493 cases reported during the 2005 to 2010 period, 86% (n=28,194) were reported by the five countries reporting the largest number of cases, namely France (n=8,388), Germany (n=3,164), Italy (n=6,401), Spain (n=7,515) and the United Kingdom (n=2,636). Of these, 99% (n=27,707) had a known date (or month) of disease onset. Overall, a slightly increasing linear trend in the number of reported cases was observed over the period ($p<0.05$) (Figure 3).

Discussion

Following several years of relatively stable LD notification rates from 2007 to 2009, we observed a 12% increase of the ASR in the EU countries, Iceland and Norway in 2010 compared with 2009. It is noteworthy that this increase mainly occurred in community-acquired cases reported by France, Germany and the Netherlands with dates of disease onset in August and September while Italy and Spain continued to report a high number of cases but similar to what was observed in previous years. It can probably partly be explained by the increasing trend in the reported number of cases observed since 2005. It is unlikely a random variation and an artefact due to reporting issues can be ruled out, as cases represent true cases checked by the countries participating in the network. None of them reported a change in their surveillance system and the increase was mainly concentrated on two months and three countries.

Most of the excess cases were sporadic cases or part of small clusters which went unnoticed. To our knowledge, the largest outbreak reported in 2009–10 involved a Slovenian nursing home in August 2010 [10]. National reports from France and the Netherlands mentioned increasing numbers of LD cases during summer 2010 but causes remained unclear and were to be further investigated [11,12] The Dutch notification rate in 2010 was the highest ever recorded since introducing LD surveillance in the Netherlands in 1988 [11]. However, since the Netherlands reported fewer cases in 2009 as compared to previous years, the observed increase of the ASR (+82%) should be interpreted with care. If we compared 2010 with 2008 ASR, the increase would be around 40%, more in line with the increase observed in France and Germany. Of note, the 2010 increase in France was more pronounced in eastern regions [12] as previously documented for the period 2002 to 2008 as well [13].

The Dutch region with the highest notification rate was located in the northeast of the country [11]. Having relatively confined regions affected at the same time would suggest a global temporary environmental change such as a heat wave, in conjunction with heavy rains. This would be supported by previous findings suggesting an impact of climate on the number of cases reported [14-17]. In the absence of any obvious explanatory factor, the summer peak in reported cases may have been related to the exceptionally warm summer observed in 2010 Europe [18]. Unfortunately, since places of residence were not collected at the EU level, it was not possible to introduce environmental variables such as temperature or precipitation with conditions likely to vary substantially from one region to another for a given country. Interestingly, the cases reported during this peak did not differ from other cases in terms of age and sex or outcome.

The 2009-10 data also confirm previous findings regarding the wide range of LD notification rates in Europe. When restricting the calculation of ASR to community-acquired cases, rates observed can be explained neither by environmental conditions nor by national legislation regarding potential sources of exposure such as wet cooling systems [19]. Thus, the number of cases reported in several European countries, from Germany to Greece, remains far below what would be expected. The reservoir of unascertained cases would probably be found in community-acquired cases in countries that have so far been poorly diagnosed and reported. We expect these countries to drive any future increase in the number of cases reported.

Conclusion

LD is an infectious disease leading to the death of around 500 EU citizens every year. In 2010, an as yet unexplained increase of cases of community-acquired LD cases was observed mainly in France, Germany and the Netherlands in August and September. Although consistent with the overall increasing trend observed since 2005, it is striking that this increase was concentrated over a short period of time and in a relatively restricted geographical area. This increase in 2010 indicates an impact on the disease incidence in relation with probable weather conditions or other environmental factors. A possible explanation would be the unusually hot summer 2010. With global warming and an increasing risk of extreme weather in the near future, such situations should be further investigated to target campaigns of information and control measures. More research would be needed to identify the factors associated with sporadic community-acquired cases. The collection of geographical information at sub-national level should help validate the impact of climate on LD incidence at the European level. Last, reasons for the low notification rates observed in eastern and south-eastern European countries need to be elucidated by targeted studies aimed at identifying the causes of under-ascertainment.

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Conflicts of interest

None declared.

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Capacities, practices and perceptions of evidence-based public health in Europe

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Evidence-based methodologies are used to synthesise systematic high-quality evidence and were first applied in clinical practice. Evidence-based public health, however, is still in its early stages. The European Centre for Disease Prevention and Control sought the insight of European organisations working and providing services in the field of public health on current practices, capacities, perceptions and predictions of evidence-based public health. A survey was sent to 76 organisations. A response rate of 36% was achieved, representing 27 organisations from 16 countries. Systematic reviews were the most commonly offered service, followed by health technology assessments and rapid assessments. Of 25 respondents, 13 believed that evidence-based methodologies were poorly integrated into public health. The main perceived barriers to the further development of evidence-based public health included 'lack of formalised structure or system', 'resource constraints' 'lack of understanding of evidence-based methodologies by policy makers' and 'lack of data'. Nevertheless, 22 of 27 respondents believed that evidence-based methodologies will play an increasingly important role in public health in future. However, several barriers need to be overcome. Consistent frameworks and consensus on best practices were identified as the most pressing requirements. Steps should be taken to address these barriers and facilitate integration and ultimately public health policies.

Introduction

'Evidence-based' refers to the identification and application of the best available evidence to the topic or field in question [1-3]. The concept of evidence-based practice was initially conceived for clinical medicine, i.e. evidence-based medicine (EBM). Its successes paved the way for integration of the basic principles of evidence-based practice into public health. By employing particular evidence-based methodologies, evidence-based public health (EBPH) seeks to base decision making and policy on a combination of "best available evidence with the knowledge and considered judgements from stakeholders and experts to benefit the needs of a population" [2].

Despite a strong rationale for evidence-based practice and its application and success in EBM, EBPH is generally considered to be a developing field of public health [2,4]. In 2009, the European Centre for Disease Prevention and Control (ECDC) launched the *Flu Technical Report* [5] which contained an assessment of the quality of the evidence base for 27 influenza-related interventions. The results showed that 48% of interventions were based on the lowest grade of evidence (i.e. case reports, small poorly controlled observational studies, poorly substantiated larger studies) while only 7%, the vaccination-based interventions, achieved the highest grade of evidence (i.e. systematic reviews of diverse primary studies rather than primarily modelling, well-designed epidemiologic studies, or randomised control trials).

Methodologies for evidence-based public health are of crucial importance in achieving its mandate of identifying, assessing and communicating current and emerging health threats through searching for, collecting, collating, evaluating and disseminating relevant scientific and technical data [6]. Owing to the importance of evidence-based public health and the perceived value in facilitating its wider application, ECDC launched a survey in 2012 to investigate:

- the capacities and practices of evidence-based methodologies in a selected panel of public health institutes,
- perceptions of the current and future extent of integration of evidence-based methodologies into European public health,
- and perceived barriers to wider assimilation of evidence-based methodologies into European public health.

Table 1

List of participating organisations, survey on evidence-based public health, 2012 (n=27)

Organisation	Country	Organisation	Country
Federal Ministry of Health	Austria	The Agency for Regional Health Services - Piedmont[a]	Italy
Health Austria GmbH[a]	Austria	Catholic University of Rome	Italy
The Main Association of Austrian Social Security Institutions[a]	Austria	State Health Care Accreditation Agency, Ministry of Health	Lithuania
Belgian Healthcare Knowledge Centre	Belgium	Slovak Agency for Health Technology Assessment	Slovakia
Agency for Quality and Accreditation in Health Care and Social Welfare, Department for Development, Research and Health Technology Assessment	Croatia	Andalusian Agency for Health Technology Assessment	Spain
Ministry of Health	Czech Republic	Department of Health, Basque Government	Spain
Health Technology Assessment and Health Services Research from Public Health and Quality Improvement, Central Region	Denmark	Aragon Institute of Health Sciences[a]	Spain
Statens Serum Institut, National Institute for Health Data and Disease Control	Denmark	Institute of Health Carlos III[a]	Spain
Finnish Office for Health Technology	Finland	National Board of Health and Welfare	Sweden
French National Authority for Health	France	Swedish Council on Technology Assessment in Health	Sweden
German Agency for Quality in Medicine	Germany	Scottish Intercollegiate Guidelines Network	United Kingdom
Federal Joint Committee	Germany	Health Protection Scotland	United Kingdom
Directorate of Health	Iceland	Veterinary College, University of Nottingham	United Kingdom
The National Agency for Regional Health Services[a]	Italy		

[a] Translation provided by the author.

Methods

Eligible participant organisations were selected from lists of associates and partners of the European network for Health Technology Assessment (EUnetHTA) as well as member lists of the Guidelines International Network (GIN). These networks were selected because they keep extensive lists of organisations working on guidelines relevant to public health and of their activities in the field of EBM.

We identified 120 individual organisations based in the in the European Union (EU) and its accession countries or in the European Economic Area (EEA). Owing to ECDC's mandate, organisations not active in the field of communicable diseases were excluded. Many institutes or organisations, however, are active in both communicable and non-communicable disease evidence generation, and 76 organisations were selected for inclusion in the study.

A survey, composed of thirteen core questions (the list of questions can be obtained from the authors on request), was developed using a commercially available online software. The survey was distributed to switchboard email addresses for the selected participant organisations. Respondents were given one week to complete the questionnaire. A follow-up email was sent to those who had not responded by the deadline. Text responses were grouped according to major themes.

Results

An initial response rate of 15% was attained, which rose to 36% (27 of 76) upon completion of the follow-up. We received 28 responses from 27 organisations in 16 countries: 15 EU/EEA Member States and one EU Accession State (Table 1). Responses were collected from a variety of organisations, including federal (national or regional) (n=23), academic (n=2) and private (n=2) institutions.

Of the 28 institutions that responded, 26 offered evidence-based methodology services. Systematic reviews were the most commonly offered evidence-based

Table 2

Evidence-based methodology services offered by respondent organisations, survey on evidence-based public health, 2012 (n=28)

Answer	Responses
Systematic reviews	21
Health technology assessments	20
Rapid assessments	20
Guidelines	14
Other 1	7
Do not employ EBM	2

EBM: evidence-based medicine.

1 Audits and standards, evidence-based practice reviews, education for practice, scientific notes, summaries of health technology assessments, and decision analysis models.

Table 3

Evidence-based methodology services offered by respondent organisations, survey on evidence-based public health, 2012 (n=25)

Answer	Responses
Poorly integrated	13
Sufficiently integrated	9
Overly integrated	3

Table 4

Perceived level of future integration of evidence-based methodologies into European public health, survey on evidence-based public health, 2012 (n=27)

Answer	Responses
Less important	0
Same level of importance	5
More important	22

methodology, followed by health technology assessments and rapid assessments (Table 2). Recent examples include *Hepatitis C: Screening and Prevention*, an HTA from the Belgian Healthcare Knowledge Centre [7] and *Effectiveness of prehospital care: a systematic review* from the Finnish Office for Health Technology [8]. Much work was also available in the area of non-infectious diseases. Recent examples include an HTA entitled *Mammography* by the Lithuanian State Health Care Accreditation Agency [9], and a report on *Genetic testing for cardiac transplant rejection* by the Andalusian Agency for Health Technology Assessment [10]. Three organisations reported offering a single service, while nine offered four or more services. Six organisations responded that they had other services in addition to the listed answers. Health Protection Scotland, for example, develop audits and standards and provide education for practice through evidence-based practice reviews, while the German Federal Joint Committee offered summaries of health technology assessments. Other services included scientific notes, and decision analysis models.

While 13 respondents indicated that evidence-based methodologies were currently poorly integrated into public health, nine believed they were sufficiently integrated, and a further three believed that evidence-based methodologies were overly integrated (Table 3).

Responses to the open question about major barriers preventing the use of evidence-based methodologies in public health were grouped and analysed. Six main barriers were identified. ‘Lack of a formalised structure or system’ (n=8) was the most frequently noted one, followed by ‘lack of data’ (n=6), ‘resource constraints’ (financial and human) (n=6), and ‘lack of understanding of evidence-based methodologies by policy makers’ (n=6). The answers ‘too time consuming’ (n=4) and ‘lack of experience in evidence-based methodologies (n=3) were also noted.

Despite the number and variety of perceived barriers, the majority of respondents (22 believed that evidence-based methodologies will be used more prominently in public health decision making processes in the future (Table 4).

Discussion

This survey aimed to assess capacities and practices surrounding evidence-based methodologies in European public health. Specifically, it sought insight into perceptions concerning current and future integration, and associated barriers to wider assimilation of such methods.

Of 27 respondent organisations, 26 offered evidence-based methodology services. That these organisations were distributed through 16 EU/EEA countries is a sign that EBPH is widely practiced in Europe, across several of private, public and academic institutions. Many organisations were active in evidence generation for communicable as well as non-communicable diseases. The majority of respondents (13 of 25) believed that evidence-based methodologies were insufficiently integrated into public health. These findings reflect those in the available literature [2] and point to a need to foster the growth of EBPH in the area of infectious and non-infectious diseases.

All respondents indicated that barriers exist that prevent greater assimilation of evidence-based methodologies into public health. The most frequently quoted barrier was 'a lack of formalised structure or system' which was quoted by eight of the respondents. This criticism refers to different elements of structural deficiency and conflicting advice about best practices, from a lack of agreed grading systems and adaptation to different situations, to poorly defined communication channels. Efforts are being made to address these issues through harmonising evidence-based practices and advice at international and national level. Internationally, the European Network for Health Technology Assessments (EUnetHTA), for example, aims to stimulate and improve health technology assessment processes predominantly for non-communicable diseases. The Guidelines International Network (GIN) is a global network that intends to improve the development, adjustment, distribution and implementation of evidence-based guidelines. Finally, ECDC has released a technical report on *Evidence-based methodologies for public health* [2], exploring how methods of evidence-based medicine can be applied in public health in the field of infectious diseases. At a national level, many national bodies such as the Health Protection Agency in the United Kingdom produce evidence-based guidance documents. Recent examples include the *Health Care Associated Infection Operational Guidance and Standards for Health Protection Units* [11], and an international workshop on procedures for the development of evidence-based recommendations for vaccinations, organised by the Robert Koch-Institute in Germany. Nevertheless, the majority of respondents still indicate the lack of a formal system coordinating EBPH as the single largest barrier to its proliferation. These findings support those of a working group on evidence-based methodology organised by ECDC in 2011 [2], as well as published results [12,13].

'Resource constraints', 'lack of understanding of evidence-based methodologies by policy makers' and 'lack of data' were the next most frequently mentioned barriers, quoted by six respondents each. Indeed, adhering to the standards set by EBPH can be resource-intensive, in terms of human as well as financial resources. The current trend towards fiscal austerity in some European governments may further increase this problem: Budget cuts to publically funded agencies are likely to affect negatively an already resource-constrained sector, and unlike EBM, in which the majority of large randomised control trials are industry-funded, EBPH is likely to remain funded predominantly by the public sector. Conversely, however, fiscal austerity could also promote evidence-based public health by encouraging data production on topics of efficiency and cost effectiveness. In addition, well-constructed evidence has international benefits. Sharing of public health evidence could prevent redundant (and cost-intensive) work, and should be further promoted.

For an online survey, the study obtained a reasonable response rate of 36%. We believe the results are of general relevance owing to the number and range of European countries and organisations represented. Bias has been identified with regard to the type of institutes responding to the questionnaire, with public organisations disproportionately represented. Governmental and public organisations accounted for 85% of responses but represented 68% of the organisations originally contacted. Academic institutions were well represented, whereas commercial organisations were underrepresented. Owing to, among other things, differences in funding and the perceptions of regulations, public and commercial organisations may have differing perspectives on EBPH. The findings may therefore not fully reflect the interests of commercial organisations working in EBPH.

The findings of this study add to a growing body of literature concerning the importance of EBPH [4,14-16]. They reiterate the widely held view that EBPH is still underdeveloped [4], but will play an increasingly integral role in public health decision making processes for both communicable and non-communicable disease in the future. Limited frameworks and limited consensus on best practices, lack of understanding of evidence-based methodologies by policy makers, lack of data, and resource constraints were identified as major barriers to a greater integration of evidence-based methodologies into public health as perceived by the participants. Systematically addressing these barriers and facilitating rapid integration of evidence-based methodologies into public health should remain a priory. Evidence-based research can allow policy makers to prioritise resources towards cost-effective policies and should therefore be incorporated into every decision-making process [2,4,17]. Cultivating such an approach through promoting the integration of evidence-based methodologies is likely to improve the targeting of resources to the major health concerns of today [18].

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ECDC publishes its first data on antimicrobial consumption in Europe

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On Monday 4 March 2013, the European Centre for Disease Prevention and Control (ECDC), launched a new interactive database and published its first report on surveillance of antimicrobial consumption in Europe.

ECDC collects data on antimicrobial consumption from 29 European Union (EU) and European Economic Area (EEA) countries through the European Surveillance of Antimicrobial Consumption Network (ESAC-Net), which is a Europe-wide network of national surveillance systems. The report presents data for 2010 from the community (primary care) and the hospital sector.

The interactive database provides public access to tables, maps and figures on antimicrobial consumption down to the 4th level of the anatomical therapeutic chemical (ATC) classification. Additionally the interactive database contains antimicrobial consumption data from 1997 to 2009. These data were collected by the EU-funded European Surveillance of Antimicrobial Consumption (ESAC) project before it was transferred to ECDC in July 2011 and was renamed ESAC-Net. ECDC will shortly update the interactive database with data for 2011 and 2012.

The report and the interactive database include data for three major groups of antimicrobials: antibacterials for systemic use (ATC group J01); antimycotics for systemic use and antifungals for systemic use (ATC groups J02 & D01BA) and antivirals for systemic use (ATC group J05).

The report shows that, on average, 90% of antibacterials for systemic use are consumed in the community i.e. outside hospitals. In 2010, the consumption of antibacterials for systemic use varied by a factor of 3.5 between the participating countries: from 39.4 to 11.1 Defined Daily Doses (DDD) per 1,000 inhabitants and per day. The increasing trend in consumption of antibacterials for systemic use observed in the community in previous years was discontinued in 2010. For the first time, data on antimycotics and antifungals for systemic use from the hospital sector are presented.

In order to make valid inferences regarding the determining factors behind the observed changes and trends in antimicrobial consumption, additional data would be needed on prescriptions, indications for prescribing as well as information on national programmes on the prudent use of antimicrobials.

ECDC aims to provide timely data and independent reference information on antimicrobial consumption in Europe, to support EU/EEA countries in their efforts to promote rational use of antimicrobials, and to prevent and control antimicrobial resistance.

The first ESAC-Net report is available for downloading on the ECDC website: http://ecdc.europa.eu/en/publications/Publications/antimicrobial-antibiotic-consumption-ESAC-report-2010-data.pdf

The ESAC-Net interactive database is accessible on the ECDC website: http://ecdc.europa.eu/en/activities/surveillance/ESAC-Net/database/Pages/database.aspx

ECDC publishes the annual epidemiological report 2012

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The European Centre for Disease Prevention and Control (ECDC) released the sixth edition of its annual epidemiological report on communicable diseases in Europe [1]. It provides a comprehensive summary of surveillance data for 2010 and an analysis of the public health threats detected in 2011 through ECDC's routine epidemic intelligence.

This report analyses surveillance data on the key infectious diseases reported in the 27 European Union (EU) Member States and three European Economic Area (EEA) countries: Liechtenstein, Iceland and Norway.

Data for 2010 show that tuberculosis (TB) remains a common infection causing an important disease burden, with more than 70,000 cases notified annually in EU/EEA countries, although the reported overall TB rate continues to decline at about 4% per year.

During the 2010/11 influenza season, the pandemic virus (influenza A(H1N1)pdm09) continued to circulate widely and was the dominant type A virus in Europe, co-circulating with an increasing proportion of type B viruses at the end of the season.

Human immonodeficiency virus (HIV) remains one of the major public health problems in EU/EEA countries, with a total number of around 28,000 new cases annually. In 2010, men who have sex with men represented the largest group of cases (38%).

While Campylobacter infections are the most frequently reported gastrointestinal infections in all EU/EEA countries, a number of other gastrointestinal infections such as brucellosis, trichinellosis, hepatitis A, are common only in certain countries and regions within the EU.

Vector-borne diseases remain a significant burden for the Member States, partly through infected travellers returning from countries where some of these diseases are endemic, in particular malaria, dengue fever and chikungunya.

Most vaccine-preventable diseases continued to show either a declining or stable trend in reported incidence. However, the number of measles cases reported in 2010 increased compared with the previous years. A total of 32,480 confirmed cases were reported in 2010.

Antimicrobial resistance in Europe continued to increase, especially in Gram-negative pathogens, while the situation appeared more stable for Gram-positive pathogens.

In 2011, ECDC monitored 64 public health threats, which represent a 31% decrease compared with 2010. In 2011, threats were mainly related to food- and waterborne diseases (36%), to diseases of environmental and zoonotic origin (31%), to influenza (11%) and others (antimicrobial resistance and healthcare-associated infections, sexually-transmitted infections, vaccine-preventable diseases or events not directly related to diseases).

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