Eurosurveillance

Volume 13, Issue 50 - 11 December 2008

## Rapid communications

HIV/AIDS surveillance in Europe: update 2007 2
by MJ van de Laar , G Likatavicius, AR Stengaard, MC Donoghoe

HIV among injecting drug users in Europe: increasing trends in the East 5
by L Wiessing, MJ van de Laar , MC Donoghoe, B Guarita, D Klempová, P Griffiths

Anorectal lymphogranuloma venereum: the first two confirmed cases in Portugal 8
by R Castro, T Baptista, A Vale, H Nunes, E Prieto, K Mansinho, F da Luz Martins Pereira

## Surveillance and outbreak reports

Syphilis epidemiology in Sweden: re-emergence since 2000 primarily due to spread among men who have sex with men 10
by I Velicko, M Arneborn, A Blaxhult

Reported cases of congenital syphilis in the French national hospital database 15
by N Nicolay, A Gallay, A Michel, J Nicolau, JC Desenclos, C Semaille

An international outbreak of Shiga toxin-producing Escherichia coli O157 infection due to lettuce, September – October 2007 18
by I Friesema, G Sigmundsdottir, K van der Zwaluw, A Heuvelink, B Schimmer, C de Jager, B Rump, H Briem, H Hardardottir, A Atladottir, E Gudmundsdottir, W van Pelt

## Meeting reports

Ethical and legal issues related to health access for migrant populations in the Euro-Mediterranean Area 23
by E Negro Calduch, A Diaz, M Diez, for the project “Impact of migration on HIV and TB Epidemiology in the Mediterranean Area”

## News

Concerted international response to control ongoing cholera epidemic in Zimbabwe 26
by Editorial team

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# HIV/AIDS surveillance in Europe: update 2007

**M J van de Laar (marita.van.de.laar@ecdc.europa.eu)[1], G Likatavicius[1], A R Stengaard[2], M C Donoghoe[2]**
1. European Centre for Disease Prevention and Control (ECDC), Stockholm, Sweden
2. World Health Organization Regional Office for Europe, Copenhagen, Denmark

Human immunodeficiency virus (HIV) infection remains of major public health importance in Europe, with evidence of increasing transmission of HIV in several countries. This article provides an overview of HIV and acquired immunodeficiency syndrome (AIDS) surveillance data, and indicates that since 2000 the rate of newly reported cases of HIV per million population has almost doubled in Europe. In 2007, a total of 48,892 cases of HIV infection were reported from 49 of 53 countries in the Region, with the highest rates in Estonia, Ukraine, Portugal and the Republic of Moldova. In the European Union (EU) and European Free Trade Association (EFTA) countries, the predominant mode of transmission for HIV infection is sex between men followed by heterosexual contact. Injecting drug use is still the main mode of transmission in the eastern part of the WHO European region, while in the central part heterosexual contact is the predominant mode of transmission. In 2007, the reported number of AIDS cases diagnosed decreased in the Region overall, except in the eastern part. HIV/AIDS surveillance data are vital to monitor the trends of the HIV epidemic and evaluate public health responses.

## Introduction

Since January 2008, the European Centre for Disease Prevention and Control (ECDC) and the World Health Organization Regional Office for Europe have been jointly carrying out the HIV/AIDS surveillance in Europe [1]. This article presents the main findings for the whole WHO European Region, the three geographical regions of the WHO European Region (West, Centre and East)* and the European Union (EU) and European Free Trade Association (EFTA) countries.

## HIV case reports in WHO European Region

In 2007, 48,892 newly diagnosed HIV cases (76 per million population) were reported from 49 of the 53 countries in the WHO European Region (no data from Austria, Italy, Monaco and the Russian Federation). In the three parts of the WHO European Region, the rate of newly reported cases of HIV per million population was highest in the East (Table 1); whereas among individual countries, the highest rates were reported in: Estonia (472 per million), Ukraine (285 per million), Portugal (217 per million) and the Republic of Moldova (204 per million). Between

Table 2

**Characteristics of newly diagnosed cases of HIV infection reported in the EU/EFTA countries*, 2007**

| | EU/EFTA countries* |
|---|---|
| Number of HIV cases | 26279 |
| Rate per million population | 64.1 |
| Percentage of cases: | |
| Age 15–29 years | 28% |
| Female | 31% |
| Transmission mode**<br>Heterosexual***<br>Men who have sex with men<br>Injecting drug users | <br>29%<br>39%<br>9% |

* Missing data: Italy, Austria.
** Transmission group unknown is excluded in the percentages.
*** Excludes persons originating from countries with generalised epidemics (4422 in total).

Table 1

**Characteristics of newly diagnosed cases of HIV infection reported in the WHO European Region and by geographical area, 2007**

| | WHO European Region* | West* | Centre | East* |
|---|---|---|---|---|
| Number of HIV cases | 48892 | 24202 | 1897 | 22793 |
| Rate per million population | 76.4 | 77.0 | 10.1 | 164.8 |
| Percentage of cases: | | | | |
| Age 15–29 years | 33% | 26% | 41% | 40% |
| Female | 33% | 31% | 24% | 36% |
| Transmission mode**<br>Heterosexual***<br>Men who have sex with men<br>Injecting drug users | <br>36%<br>20%<br>32% | <br>29%<br>40%<br>8% | <br>53%<br>30%<br>13% | <br>42%<br>0.4%<br>57% |

* Missing data: Austria, Italy, Monaco, Russian Federation.
** Transmission group unknown is excluded from the percentages.
*** Excludes persons originating from countries with generalised epidemics (4555 in total; 4540 in West).

2000 and 2007, the annual rate of newly reported cases of HIV per million population has increased from 39 to 75 per million (90% increase) among the 44 countries that have consistently reported.

### HIV case reports in the EU/EFTA

In 28 of the 30 EU/EFTA countries, 26,279 cases of HIV infection (64 per million) were reported in 2007 (Table 2), with the highest rates reported in Estonia (472 per million), Portugal (217 per million) and Latvia (149 per million). The predominant mode of transmission is sexual contact between men (39%), followed by heterosexual contact (29%), when persons originating from countries with generalised epidemics are excluded. Injecting drug use accounted for 9% of newly reported infections. Among the countries that have consistently reported, the rate has increased from 44 per million in 2000 to 58 per million in 2007. Rates of reported HIV infection have doubled in Bulgaria, Czech Republic, Hungary, the Netherlands, Slovakia, Slovenia, Sweden and the United Kingdom.

The number of HIV reports among men who have sex with men (MSM) has increased by 39% between 2003 and 2007 (Figure 1). The number of heterosexually acquired cases has remained fairly stable at around 6,000 cases (although higher numbers were reported in 2004-2006). Further, the number of cases originating from countries with generalised epidemics amongst heterosexually acquired cases varied between 5,000 in 2005 and 4,400 in 2007. The number of HIV reports among injecting drug users (IDUs) has declined by 30% between 2003 and 2007.

### HIV case reports by geographical area

The HIV epidemics across the three geographical areas show remarkable differences (Figure 2).

The data suggest that the HIV epidemic in the western part of the WHO European Region is characterised by a continuing increase in sexual transmission of HIV infection. The distribution of transmission modes largely mirrors that described for the EU/EFTA countries. In 2007, 24,202 new cases of HIV infec¬tion (77/million) were reported from 20 countries (Table 1).

The HIV epidemic in the central part of the WHO European Region remains at low and stable levels (1,897 cases; 10 per million), although there is evidence of increasing sexual (both heterosexual and homosexual) transmission in many countries (Table 1). Heterosexual transmission accounted for 53% of all reported cases, followed by 30% cases reported among MSM and 13% cases among IDUs, data on transmission mode were missing for 33% of cases.

In the eastern part of the WHO European Region, in 2007, 14 countries reported 22,793 new HIV cases (165 per million), of which 58% were from Ukraine. The predominant mode of trans¬mission in this region is through IDUs, accounting for 57% of the reported cases. Between 2000 and 2007, the rate of newly reported HIV infections has in¬creased from 54 per million to 160 per million. However, the numbers in this region are greatly underestimated as no data were reported from the Russian Federation.

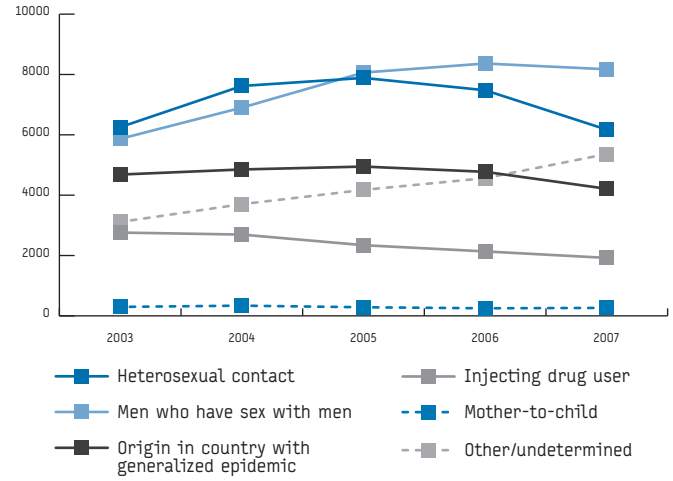
### AIDS diagnoses

In 2007, 5,244 AIDS cases were reported as being diagnosed in 48 of the 53 countries (9 per million) in the WHO European Region (no data from Italy, Kazakhstan, Monaco, Russian Federation and Ukraine). Due to incomplete reporting and no adjustment for reporting delays the total number of AIDS cases is underestimated.

Trends in AIDS diagnoses per million population (Figure 3) have continued to decrease in the WHO European Region overall, from 16 per million in 2000 to 9 per million in 2007, mainly due to decrease in western and central regions probably due to a combination of reporting delay and the effect of highly active

**Figure 1**

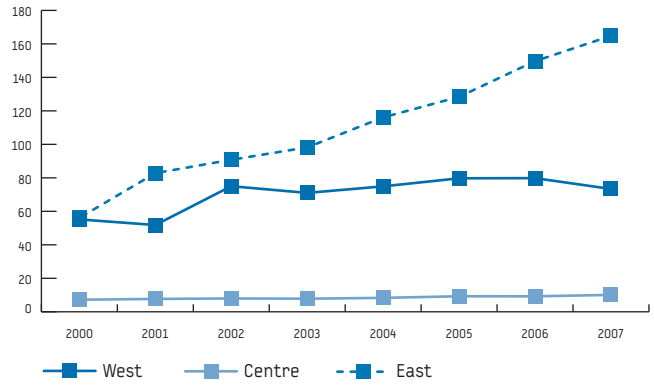
**Number of reported HIV infections by transmission mode, origin and year of notification, EU/EFTA, 2003–2007**




Data were not available for: Austria, Estonia (except for IDU), Italy, and Malta.

**Figure 2**

**HIV cases per million population in geographic areas of the WHO European Region (West, Centre, East) by year of notification, 2000-2007**




Data not included from: West: Andorra, Austria, France, Italy, Malta, Monaco, Spain; Centre: Serbia; East: Russian Federation.

antiretroviral therapy (HAART) [2]. However, during the same period, the rate increased in 21 (mainly eastern) countries, with the largest increases in Belarus and the Republic of Moldova.

## Discussion and conclusion

HIV infection remains of major public health importance in Europe with a continued increase in the number of HIV cases reported [1,3]. In contrast, the number of AIDS cases diagnosed (not adjusted for reporting delays) has continued to decline, except in the eastern part of the WHO European Region. The data suggest evidence of increased transmission of HIV in many countries. However, the predominant transmission group varies by country and geographical area and the data illustrate the wide diversity in the epidemiology of HIV in Europe.

In 2007, in the EU/EFTA countries, also reflecting the western part of the WHO European Region, the highest proportion of HIV cases was reported among MSM. National prevention programmes aimed at reducing HIV transmission within Europe should have a strong focus on MSM [4]. Migrant populations should also be targeted in national prevention programmes and access to treatment and care services should be ensured. Although there seems to be a decline in the number of new diagnoses among IDUs, this is still the predominant transmission group in the Baltic States. In the central part of the WHO European Region, levels of HIV remain low and stable, al¬though there is evidence of increasing sexual transmission in many countries. In the eastern part, the number of HIV cases has increased substantially, mainly driven by an increase in cases acquired through IDU but also by an increase in heterosexually-acquired cases. Interventions to control HIV among IDUs should be the cornerstone of HIV prevention strategies in the eastern part but measures should also be strengthened to prevent heterosexual transmission, especially targeted at those with high-risk partners.

In interpreting the presented data, it should be taken into account that data are incomplete due to non-reporting from a few large countries. Therefore the findings and conclusions are limited to the surveillance data reported by these 49 countries. Had all data from all countries been available, the total number of reported HIV infections could have doubled to almost 100,000 cases in 2007.

Surveillance of HIV/AIDS is essential to monitor the epidemic and evaluate the public health response to control the transmission of infections. Countries in Europe need to ensure that surveillance data is of high quality by implementing case-based reporting systems for HIV and AIDS cases and ensuring its completeness, especially regarding the probable mode of transmission. Achieving full coverage of reporting from all countries in Europe is of utmost importance.

*The WHO European Region comprises:

The West, 23 countries: Andorra, Austria (EU), Belgium (EU), Denmark (EU), Finland (EU), France (EU), Germany (EU), Greece (EU), Iceland (EFTA), Ireland (EU), Israel, Italy (EU), Luxembourg (EU), Malta (EU), Monaco, the Netherlands (EU), Norway (EFTA), Portugal (EU), San Marino, Spain (EU), Sweden (EU), Switzerland (EFTA), United Kingdom (EU).

The Centre, 15 countries: Albania, Bosnia and Herzegovina, Bulgaria (EU), Croatia, Cyprus (EU), Czech Republic (EU), Hungary (EU), the Former Yugoslav Republic of Macedonia, Montenegro, Poland (EU), Romania (EU), Serbia, Slovakia (EU), Slovenia (EU), Turkey.

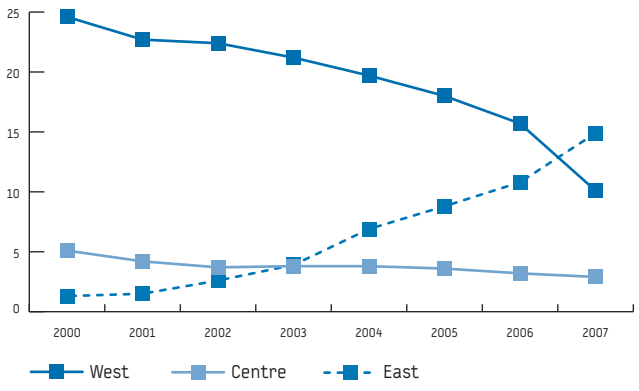
The East, 15 countries: Armenia, Azerbaijan, Belarus, Estonia (EU), Georgia, Kazakhstan, Kyrgyzstan, Latvia (EU), Lithuania (EU), Republic of Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine, Uzbekistan.


## Acknowledgements

We would like to thank all participating countries and national institutions of the European network for HIV/AIDS surveillance for their important contributions.


FIGURE 3

**Number of diagnosed AIDS cases per million population in the geographic areas of WHO European Region (West, Centre, East) by year of diagnosis, 2000-2007**




Data not included from: West: Andorra, Italy, Monaco; East: Kazakhstan, Russian Federation, Ukraine

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This article was published on 11 December 2008.

Citation style for this article: van de Laar MJ, Likatavicius G, Stengaard AR, Donoghoe MC. HIV/AIDS surveillance in Europe: update 2007. Euro Surveill. 2008;13(50):pii=19066. Available online: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19066

# HIV among injecting drug users in Europe: increasing trends in the East

**L Wiessing (lucas.wiessing@emcdda.europa.eu)[1], M J van de Laar[2], M C Donoghoe[3], B Guarita[1], D Klempová[1], P Griffiths[1]**
1. European Monitoring Centre for Drugs and Drug Addiction (EMCDDA), Lisbon, Portugal
2. European Centre for Disease Prevention and Control (ECDC), Stockholm, Sweden
3. World Health Organization Regional Office for Europe, Copenhagen, Denmark

The human immunodeficiency virus (HIV) epidemic among injecting drug users (IDUs) shows different developments in different parts of the European region. In the countries of the European Union (EU) and the European Free Trade Association (EFTA), the rates of reported newly diagnosed cases of HIV infection in IDUs are mostly at stable and low levels or in decline. In contrast, those rates increased in 2007 in many of the other (eastern) countries in the World Health Organization (WHO) European Region, suggesting that the HIV epidemic among IDUs in Europe is still growing. In countries or regions where indicators of HIV incidence show upward trends, existing prevention measures may be insufficient and in need of strengthening. In the EU/EFTA region the larger availability of harm reduction measures such as opioid substitution treatment and needle and syringe programmes may have played a key role in containing the epidemic among IDUs.

## Introduction

Human immunodeficiency virus (HIV) and hepatitis B and C infection are an important cause of mortality and morbidity among injecting drug users (IDUs) in Europe and result in high costs to society [1,2,3 ]. The European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) is monitoring HIV and hepatitis B and C among injecting drug users in the European Union (EU), in partnership with the European Centre for Disease Prevention and Control (ECDC) and the World Health Organization (WHO) Regional Office for Europe. In this contribution we describe the epidemiological situation regarding HIV among IDUs in Europe in 2007. [4,5]. Our objective is to examine trends in newly diagnosed HIV infections in IDUs reported in 2007 and in data from HIV prevalence monitoring studies among IDUs in the WHO European Region countries* which participate in the European surveillance of HIV and AIDS. We compare the European Union (EU) and European Free Trade Association (EFTA) countries with the other countries in the WHO European Region, with a focus on those countries that reported the highest rates of newly diagnosed infections in 2006-7. The data have to be interpreted with caution, given several methodological limitations, which are detailed elsewhere [5,6,7].

## Trends in newly diagnosed HIV infection reported in 2007, EU/EFTA countries

Data on HIV cases attributed to injecting drug use reported in 2007 suggest that infection rates in this group are still overall falling in the EU/EFTA countries, following a peak in 2001–2, which was due to outbreaks in Estonia, Latvia and Lithuania [5]. Of the three countries that reported a rate of IDU-related HIV infections in 2006-7 of over 50 cases per million population, Portugal and Estonia continued to report a downward trend in 2006-7, while in Latvia the rate increased again to 59 per million population in 2007. Between 2001 and 2007, no marked increase in the rate of reported HIV infection has been observed in any country of this region. A few countries reported a slight increase since 2001 (e.g. Bulgaria, Sweden, United Kingdom), and this remained below one additional case per million population per year. In Bulgaria and Sweden, however, the trend has accelerated since 2003 and 2006 respectively, suggesting the potential for an outbreak.

## Trends in newly diagnosed HIV infection reported in 2007, non-EU/EFTA countries in the WHO European region

In many of the non-EU/EFTA countries in the eastern part of the WHO European region (East), the number of HIV cases in IDUs has been increasing. Even in those countries where some declines had occurred since 2001 (Russia, Belarus), new increases have been noted in more recent years [5,8]. In 2007, the rates of HIV infection per million population among IDUs varied from zero in Turkmenistan to 80 cases per million in Kazakhstan and 152 in Ukraine. For Russia, 2007 data are not available but in 2006 the rate was 78 cases per million [8] (Figure).

In the seven non-EU/EFTA countries of the central and three non-EU/EFTA countries of the western part of the WHO European Region (Centre and West), the rates remained very low at less than two cases per million, with Israel at a slightly higher rate of five cases per million.

In absolute terms, Ukraine reported the largest number of newly diagnosed cases of HIV among IDUs in 2007 with 7,087 cases, followed by Uzbekistan with 1,816 and Kazakhstan with 1,246 cases. In comparison, Russia reported 11,161 cases in 2006 [8]. Several other non-EU/EFTA countries in the East, with overall lower numbers and rates, nonetheless show an increasing trend in reported cases, suggesting that epidemics among IDUs may be taking place in the East. These include Azerbaijan, Belarus, Georgia, Kyrgyzstan, Moldova and Tajikistan.

## Trends in HIV prevalence

Prevalence data are available from 27 EU/EFTA countries over the period 2002–6 [4,6,8]. In 18 of those countries, HIV prevalence remained unchanged during the period. In four countries

(Bulgaria, Germany, Spain and Italy) prevalence showed statistically significant decreases (chi square test for trend, p<0.05), all based on national data, although regional increases were also reported in Bulgaria and Italy. In Lithuania an increase was observed at the national level. Finally, in the remaining four countries (Belgium, Czech Republic, United Kingdom and Slovenia), there was at least one sub-national sample indicating an increasing trend, despite that as far as available the national trends appeared stable and most prevalence levels remained low.

Some indications of recent HIV transmission among IDUs in the EU/EFTA region are given by reports of high prevalence levels (over 5%) among young IDUs (samples of 50 or more IDUs under age 25) in several countries: Spain (national data, 2005), Portugal (national data, 2006), Estonia (two regions, 2005), Latvia (national and in two cities, 2002-03), Lithuania (one city, 2006) and Poland (one city, 2005).

Data on HIV prevalence in IDUs for the non-EU/EFTA countries in the eastern part of the WHO European region are only available to a limited extent [8,9]. However, they suggest that prevalence in tested IDUs increased (p<0.05) between 2002 and 2006 at national level in Azerbaijan, Belarus and Ukraine, as well as in two cities in Tajikistan. Data for the Russian Federation suggest a decline in prevalence between 2002 and 2004 followed by a stabilisation between 2004 and 2006.

## Discussion

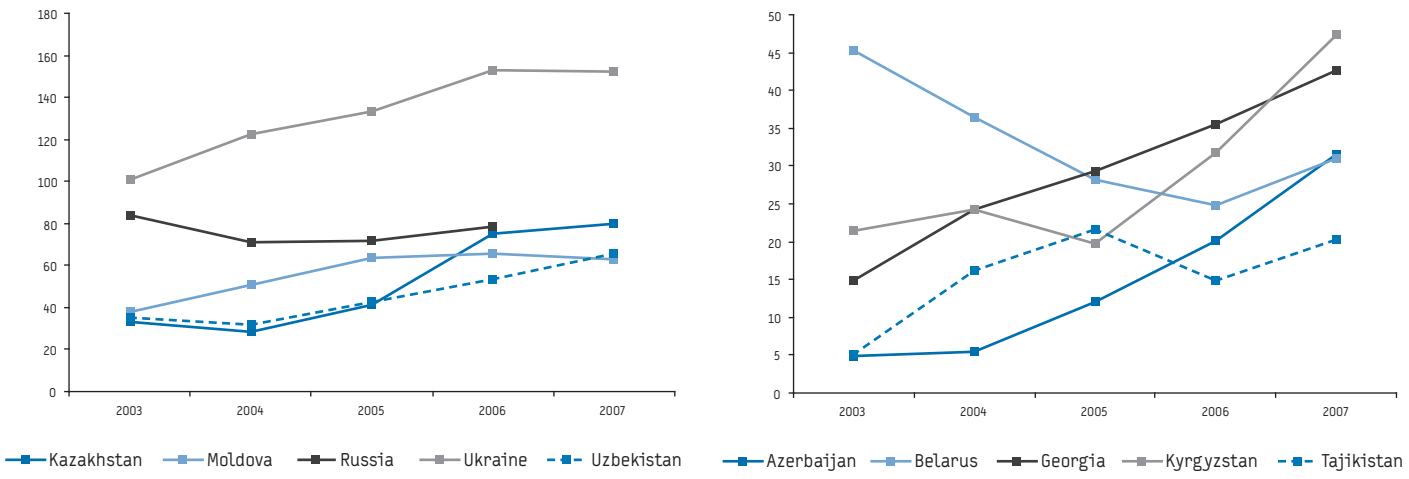
Caution is warranted in interpreting these data, given a lack of information on possible changes in testing and case reporting, completeness of reporting, and inherent difficulties in using trends in case reporting or prevalence data as indicators of incidence. However, the situation regarding HIV in IDUs in the eastern part of the WHO European Region is worrying. Data on reported HIV cases in IDUs suggest increasing incidence of HIV infection among people who inject drugs. In 2007, IDUs accounted for 57% of newly diagnosed HIV infections reported in this region. Public health measures that are currently in place to contain the epidemic among IDUs are likely insufficient and need to be reinforced. A general worsening of the already serious situation regarding HIV in IDUs in the East can pose a severe threat to the general population, due to sexual transmission from infected IDUs and, potentially, subsequent independent sexual transmission [10].

In the EU/EFTA countries, rates per million population of newly diagnosed reported cases of HIV infection among IDUs have been generally low in the recent years. In 2007, the overall rate of newly diagnosed reported infections among IDUs in the 27 EU Member States is estimated at five cases per million population. The EU compares relatively positively in a global context regarding HIV in IDUs, and especially if set against its neighbouring countries in Eastern Europe [5,11]. This may partly follow from the increased availability of prevention, treatment and harm-reduction measures, including opioid substitution treatment and needle and syringe programmes [12,13,14,15]. Other factors, such as the decline in injecting drug use that has been reported in some western countries [4,16,17], may also have played an important role. However, recent large outbreaks (e.g. in Estonia) show that vigilance cannot be lowered and explosive spread among IDUs is still possible. Also, in some of the EU countries (Estonia, Portugal, Latvia) that have experienced large epidemics among IDUs, the data suggest that HIV transmission among IDUs may still have continued at relatively high rates in 2006 and 2007. This underlines the need to ensure the coverage and effectiveness of HIV prevention practices including harm reduction and treatment for IDUs.

In conclusion, the HIV epidemic among IDUs continues to diverge between different parts of Europe. In the East the HIV epidemic shows no signs of slowing down. Countries across the European region might collaborate to better understand the driving forces of this epidemic, and the specific barriers and opportunities

**Figure**

**Newly diagnosed reported HIV infections among injecting drug users, rate per million population, non-EU/EFTA countries in the eastern part of the WHO European region, 2003-2007**




Note: Data for the Russian Federation were taken from [8].

for improving prevention in IDUs. Epidemiological surveillance and research focused on IDUs are important to guide the implementation of effective prevention strategies and interventions. Harm reduction measures such as opioid substitution treatment and needle and syringe programmes may have played a key role in reducing HIV transmission among IDUs in the EU/EFTA region. International guidance on a comprehensive package of measures aimed at reducing the harms of HIV and other infections in IDUs is available and needs to be implemented [18].

*The WHO European Region comprises:

The West, 23 countries: Andorra, Austria (EU, data for 2007 missing), Belgium (EU), Denmark (EU), Finland (EU), France (EU), Germany (EU), Greece (EU), Iceland (EFTA), Ireland (EU), Israel, Italy (EU, data for 2007 missing), Luxembourg (EU), Malta (EU), Monaco (data for 2007 missing), the Netherlands (EU), Norway (EFTA), Portugal (EU), San Marino, Spain (EU, data not national), Sweden (EU), Switzerland (EFTA), United Kingdom (EU).

The Centre, 15 countries: Albania, Bosnia and Herzegovina, Bulgaria (EU), Croatia, Cyprus (EU), Czech Republic (EU), Hungary (EU), the Former Yugoslav Republic of Macedonia, Montenegro, Poland (EU), Romania (EU), Serbia, Slovakia (EU), Slovenia (EU), Turkey.

The East, 15 countries: Armenia, Azerbaijan, Belarus, Estonia (EU), Georgia, Kazakhstan, Kyrgyzstan, Latvia (EU), Lithuania (EU), Republic of Moldova, Russian Federation (data for 2007 missing), Tajikistan, Turkmenistan, Ukraine, Uzbekistan.

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This article was published on 11 December 2008.

Citation style for this article: Wiessing L, van de Laar MJ, Donoghoe MC, Guarita B, Klempová D, Griffiths P. HIV among injecting drug users in Europe: increasing trends in the East. Euro Surveill. 2008;13(50):pii=19067. Available online: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19067

# Anorectal lymphogranuloma venereum: the first two confirmed cases in Portugal

**R Castro (ritacastro@ihmt.unl.pt)[1], T Baptista[2], A Vale[1], H Nunes[1], E Prieto[1], K Mansinho[2], F da Luz Martins Pereira[1]**

1. Unidade de Doenças Sexualmente Transmitidas (Sexually Transmitted Diseases Unit), Instituto de Higiene e Medicina Tropical (Institute of Hygiene and Tropical Medicine), Universidade Nova de Lisboa (New University of Lisbon), Lisbon, Portugal
2. Serviço de Infecciologia e Medicina Tropical do Hospital de Egas Moniz (Infectiology and Tropical Medicine Department, Egaz Moniz Hospital), Centro Hospitalar de Lisboa Ocidental, Lisbon, Portugal

We describe two cases of lymphogranuloma venereum (LGV) in men who have sex with men in Portugal in 2008. These first two confirmed cases of LGV L2b proctitis in Portugal highlight the need for an enhanced surveillance programme in Portugal.

Lymphogranuloma venereum (LGV) is a sexually transmitted infection (STI) caused by *Chlamydia trachomatis* serovars L1 to L3, which are endemic in tropical regions. However, since 2003, an outbreak of anorectal LGV has emerged in Western Europe [1-4] and in non-Europeans countries [5-7] in men who have sex with men (MSM).

In April 2008, we analysed rectal exudates, urine and blood specimens from two MSM, both infected with human immunodeficiency virus (HIV), that were suspected of having LGV. Both patients presented with an anorectal syndrome. They also had tenesmus and ulcerative laesions, but one of them also suffered from constipation and fever, while the other had inguinal lymphadenopathy and a past infection with *Treponema pallidum*. They were not co-infected with other STIs than LGV and HIV.

One patient was of Portuguese nationality and the other a Brazilian citizen. Both were residents in Portugal and acquired the infection in this country, since they had not travelled abroad six months prior to infection.

IgG antibodies against *C. trachomatis* were high (1:10,000) in both patients, as determined by indirect imunofluorecence (Euroimmun AG, Lübeck,) and *C. trachomatis* serovar L, was identified by real-time polymerase chain reaction (PCR) [8] in the two rectal exudates. Urine samples were negative. The presence of serovar L2b was confirmed by sequencing after amplification of the *omp1* gene by a nested PCR technique [9].

In accordance with the definition of LGV cases [1], the referred patients were confirmed to have LGV infection with the L2b serovar of *C. trachomatis*.

LGV outbreaks have been reported in many countries in Europe, the United States, Canada and Australia [1-7]. In some of these countries, successful enhanced surveillance programmes have been launched, for instance in France [4], the Netherlands [10], and the United Kingdom [3]. Portugal has no surveillance programme; most laboratories do not test for LGV, and not all rectal samples are genotyped.

To our knowledge, these are the first two cases of LGV L2b proctitis described in Portugal. Other cases of LGV have been described in Portugal [11], but those patients had no LGV symptoms and *C. trachomatis* serovar L was only identified in urogenital samples, in contrast to the LGV rectal presentations presently emerging in western Europe.

We therefore feel that there is an urgent need for an enhanced surveillance programme to be launched in Portugal, with a view to alerting clinicians to include LGV in the differential diagnosis of proctitis – especially in HIV-infected MSM. It is equally necessary to inform high risk populations of the signs and symptoms of LGV and of its risks of transmission in view of preventing dissemination of the disease.

## Acknowledgements

We thank our colleague Professor Doutor Joao Piedade for helping us with the final identification of *C. trachomatis*, serovar L2b.

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This article was published on 11 December 2008.

Citation style for this article: Castro R, Baptista T, Vale A, Nunes H, Prieto E, Mansinho K, da Luz Martins Pereira F. Anorectal lymphogranuloma venereum: the first two confirmed cases in Portugal. Euro Surveill. 2008;13(50):pii=19060. Available online: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19060

# Syphilis epidemiology in Sweden: re-emergence since 2000 primarily due to spread among men who have sex with men

**I Velicko (inga.velicko.smi.se)[1,2], M Arneborn[1], A Blaxhult[1]**
1. Department of Epidemiology, Swedish Institute for Infectious Disease Control, Solna, Sweden
2. Current affiliation: Department of Infectious Disease Epidemiology, Norwegian Institute of Public Health, Oslo, Norway

Syphilis has re-emerged in western Europe since 2000. Changes in sexual behaviour have facilitated the spread of syphilis especially among men who have sex with men (MSM) and improved surveillance systems and case detection have lead to an increase in the reported numbers of cases. This report describes recent trends (2000-2007) of syphilis in Sweden, where the spread among MSM, particularly in the big cities, has been a major contributor to an increase in cases. Estimated syphilis incidence among MSM was up to twenty-eight times higher than in the general Swedish male population. The most affected age group among males was 25-44 years of age. The majority of infections in men and women through heterosexual contacts were acquired abroad whereas the majority of infections attributed to sex between men were acquired in Sweden. Appropriate prevention activities are needed to reach vulnerable populations in Sweden.

## Introduction

Syphilis is a bacterial sexually transmitted infection which has several stages. Primary, or early syphilis lasts on average about three months. During this stage syphilis is very infectious. The symptoms may vary, but the first symptom of primary syphilis is often a small, painless sore (a chancre) on the genitals. It is easy to overlook the chancre and not to seek the specialist help and receive treatment. In such cases the sore heals and the infection progresses to the secondary stage which often starts with a rash that may last several weeks or even months as the most common symptom. Transmission can occur during this stage as well, especially if there is contact with mucous membranes or skin. The symptoms of secondary syphilis resolve with or without treatment. If treatment is not received, the infection progresses to the latent and late stages of syphilis. If in the late latent stage of syphilis the patient still does not receive treatment, the tertiary stage of syphilis starts, during which almost all organs can be affected. Neurosyphilis and cardiovascular syphilis are possible sequelae [1].

The World Health Organization (WHO) estimates 12 million new cases worldwide annually, of which 140,000 are estimated to occur in western Europe [2]. Syphilis can be successfully controlled by early detection and effective treatment of cases, contact tracing and effective preventive measures such as condom use [3]. The successful control of syphilis in adults also prevents congenital syphilis, which is a serious neonatal disorder leading to deformities and delayed development of a newborn if untreated [4].

Between the 1980s up to the 1990s, the incidence of sexually transmitted infections (STIs) such as syphilis and gonorrhoea decreased substantially in the western part of the World Health Organisation (WHO) European Region [5]. Increased high risk sexual behaviour and migration have contributed to the rise in the incidence of STIs since 2000; furthermore, improvements in surveillance systems and case detection have lead to higher number of reported cases [5,6]. In western Europe the resurgence of syphilis was mostly due to outbreaks among men who have sex with men (MSM) with increasing risk sexual behaviour and novel sexual networks [6-8]. This pattern was also observed in Sweden [9] where, after a decrease in reported syphilis incidence from 5.8 cases per 100,000 population in 1982 to 0.4 cases per 100,000 population in 1999, the number of reported cases increased in 2000 to 1.1 cases per 100,000 population and the rise has continued since then. This paper presents syphilis trends in Sweden from 1970 and provides a descriptive epidemiology for the years 2000-2007.

## Methods

### Surveillance system

Reporting of syphilis cases has a long history in Sweden. The first law (Lex veneris) in Sweden requiring mandatory reporting of venereal diseases, contact tracing and treatment of cases and their contacts came into force on 1 January 1919 [10]. Today the Communicable Diseases Act requires mandatory notification of syphilis cases by any health care professional e.g., general practitioner, gynaecologist, STI specialist, etc. when diagnosing an STI [11]. Contact tracing is also a mandatory activity [11]. Health care professionals electronically report notifications of STIs to the national surveillance database SmiNet (www.sminet.se), which is maintained by the Swedish Institute for Infectious Disease Control (Smittskyddsinstitutet - SMI). In the national population-based surveillance system the notification of syphilis cases (as any other notifiable STI in Sweden) includes case-based clinical notification from the health care professional and a case-based laboratory notification from the diagnostic laboratory. All notifications for STIs in the surveillance system are coded and therefore do not contain the patient's name or address. The coding is based on social security number (*personnummer*) which is a unique key for merging clinical and laboratory notification in the surveillance system. This unique code prevents double reporting of the same

**Figure 1**

**Incidence of syphilis, notified cases in Sweden, 1970-2007**

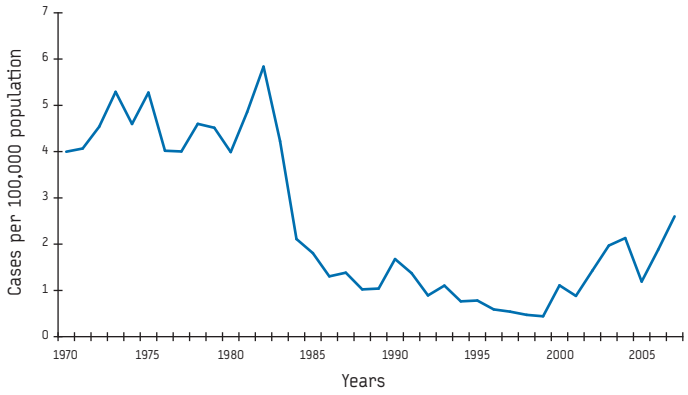



**Figure 2**

**Incidence of syphilis by sex and male-to-female-ratio, notified cases in Sweden, 1990-2007**

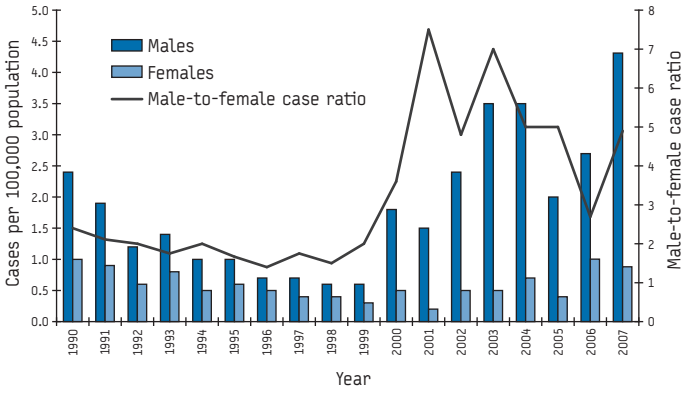
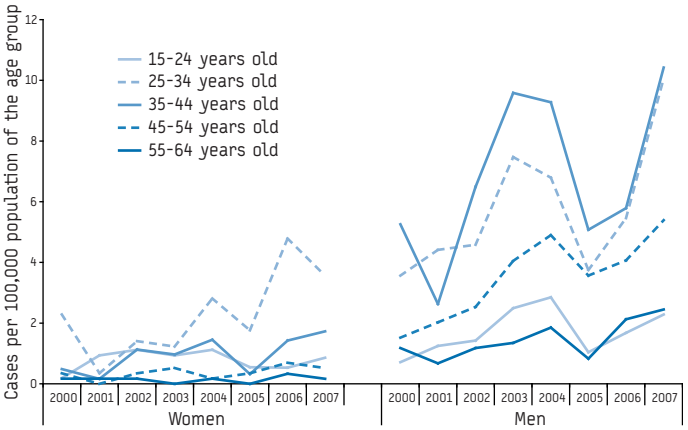



**Figure 3**

**Syphilis incidence in females and males by age group, notified cases in Sweden, 2000-2007**




case. Additional check for double reporting is done at the regional level where the staff has access to the personal data of the patient in the clinics and from laboratories.

### Syphilis notifications and incidence

Notifications are based on the following syphilis case definition used since 1997: laboratory confirmed case with clinical picture corresponding to infectious syphilis (primary, secondary and early latent syphilis with less than two years after infection) [12]. Tertiary syphilis and late latent syphilis with more than two years after infection are not notifiable in Sweden.

Forms for notifications of clinical syphilis cases contain information on age, sex, reporting county of Sweden, possible country of acquisition, as indicated through a consistent incubation period and the patient's history, type of infection (symptomatic or asymptomatic), reason for diagnosis (having symptoms, routine diagnostic, contact tracing, etc.), stage of infection (primary, secondary, early latent syphilis, late syphilis, tertiary, unknown). Information on non-notifiable late latent and tertiary syphilis is included in order to know the stage of the infection reported by the clinicians. If cases of non-notifiable stages (late latent and tertiary) of syphilis are reported, the county medical officers are in charge of eliminating them, thus only notifiable stages of syphilis are kept in the surveillance system. Also information on route of transmission is collected. If the "route of transmission", according to the information from the patient, is sexual, the patient is then asked if this was through a heterosexual or a homosexual contact. Other options such as vertical transmission from mother to child or transmission via blood products are available. Laboratory notification forms contain information on age, sex, reporting county of Sweden, type of specimen (urine, anal or pharyngeal swabs, etc.), diagnostic method used and test results.

We calculated incidence using all reported syphilis cases per 100,000 population (total, female or male, age group-specific). Data on population in Sweden and counties, for the respective years, were taken from Statistics Sweden (www.scb.se).

### Data analysis

We performed descriptive analysis by:

- person (sex and age),
- place (reporting county of Sweden and country where the infection was acquired),
- time (between 2000-2007),
- and behavioural aspects (reported route of transmission).

All analyses (proportions, incidence, male-to-female ratio) were calculated in Excel.

The incidence of syphilis among MSM in Sweden was calculated based on estimates of the proportion of men reporting sex with men from studies in the United Kingdom and Sweden, which were 2.5% [13,14].The mentioned estimates were applied for 16-44 years old male population in UK. We used the above mentioned estimate for the rough estimate of MSM population among all male age groups in Sweden.

## Results

### Overall trends

Syphilis incidence decreased significantly in the 1980s, from a high of six per 100,000 population in 1982, and continued to decline during 1990s to 0.4 cases per 100,000 (38 cases) in 1999 (Figure 1). From 2000, the incidence of syphilis began to

rise, culminating in 2.1 cases per 100,000 population (99 cases) in 2004. In 2007, an incidence of 2.6 was reported, an increase of 136% compared with the year 2000 (1.1/100,000).

**Sex**

Syphilis incidence was three to seven times higher among males than females during 2000-2007. The male-to-female ratio increased to 7.5 in 2001, being the highest since the 1990s (Figure 2). Between 2000 and 2007, 80-88% of syphilis cases were in men.

**Age**

During 2000-2007 the median age for females was on average 33 years (median age range between 2000-2007: 31–35 years), for men infected through heterosexual contacts it was 38 years (median age range between 2000-2007: 32–43 years) and for men infected through sex between men the median age was 39 years (median age range between 2000-2007: 37–41 years). Among females, age-specific syphilis incidence was highest and increased most in the age group 25-34 years (from 0.4 in 2001 to 4.8 cases per 100,000 women in 2006); a substantial increase was also seen in the age group 35-44 years in 2006 (from 0.3 in 2005 to 1.7 in 2007) (Figure 3).

Among men, during 2000-2007 the age-specific syphilis incidence was highest and increased most in the age groups 35-44 years (from 2.6 in 2001 to 10.4 in 2007), 25-34 years (from 3.6 in 2000 to 10.1 in 2007) and 45-54 years (from 1.5 in 2000 to 5.4 in 2007) (Figure 3).

**Reported route of transmission**

During 2000-2007, 51-70% of males acquired syphilis through sex between men (Figure 4). In 2006 the proportion of males who acquired syphilis via sex between men decreased to 51%, whereas the proportion of males with unknown route of transmission increased.

Two counties in Sweden (Skåne and Stockholm County) with two big cities (Malmö and Stockholm) reported the majority of syphilis cases among MSM during 2000-2007. Estimated syphilis incidence among MSM in Sweden was 20-28 times higher than that of the Swedish male population (Figure 5).

**Figure 4**

**Reported route of transmission (in percent) most likely associated with acquisition of syphilis in men, notified cases in Sweden, 2000-2007 (n=974)**

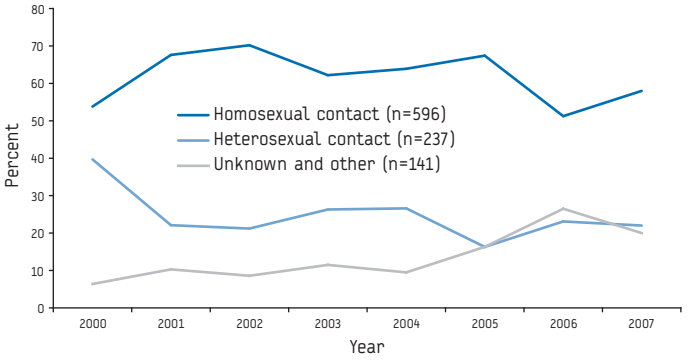
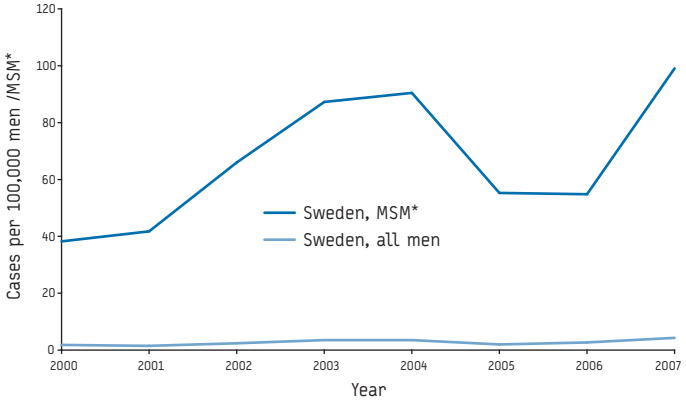



**Figure 5**

**Estimated syphilis incidence among men who have sex with men (MSM) and observed syphilis incidence among all males, notified cases in Sweden, 2000-2007**




**Table**

**Reported country of acquisition (%) of syphilis by sex and type of sexual contact 2000-2007 (n=1,047)**

| | | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|
| Females (all sexual contacts) | Sweden | 33.3 | 20.0 | 20.8 | 23.8 | 26.5 | 23.5 | 15.2 | 34.1 |
| | Abroad | 57.1 | 70.0 | 66.7 | 57.1 | 61.8 | 64.7 | 45.7 | 56.1 |
| | Unknown | 9.5 | 10.0 | 12.5 | 19.0 | 11.8 | 11.8 | 39.1 | 9.8 |
| | **Total number** | **21** | **10** | **24** | **21** | **34** | **17** | **46** | **41** |
| Males with heterosexual contacts | Sweden | 12.9 | 26.7 | 27.3 | 31.7 | 21.4 | 6.7 | 29.6 | 38.6 |
| | Abroad | 71.0 | 73.3 | 72.7 | 58.5 | 76.2 | 80.0 | 66.7 | 56.8 |
| | Unknown | 16.1 | 0 | 0 | 9.8 | 2.4 | 13.3 | 3.7 | 4.5 |
| | **Total number** | **31** | **15** | **22** | **41** | **42** | **15** | **27** | **44** |
| Males with homosexual contacts (MSM) | Sweden | 66.7 | 60.9 | 68.5 | 76.3 | 64.4 | 61.3 | 56.5 | 78.8 |
| | Abroad | 26.2 | 39.1 | 27.4 | 16.5 | 27.7 | 32.3 | 37.1 | 19.5 |
| | Unknown | 7.1 | 0 | 4.1 | 7.2 | 7.9 | 6.5 | 6.5 | 1.8 |
| | **Total number** | **42** | **46** | **73** | **97** | **101** | **62** | **62** | **113** |

### Geographic spread

Syphilis incidence varied by county and year with a constantly higher incidence in Stockholm county. During 2000-2007, on average 46% of all syphilis cases were reported from Stockholm county which accounts for 21% of Sweden's population. Other counties with large cities are Västra Götaland with Göteborg and Skåne with Malmö. On average 10% of all syphilis cases were reported from Västra Götaland county (17% of Sweden's population) and on average 14% of cases were reported from Skåne county (13% of Sweden's population). Some counties, such as Värmland, Västerbotten and Gotland, did not report any cases of syphilis for several years.

### Country of acquisition of the infection

During 2000-2007, the majority of females and heterosexual males acquired syphilis abroad while the majority of MSM acquired the infection in Sweden (Table). However, in some years data on country of acquisition were lacking.

## Discussion

Syphilis clearly re-emerged in Sweden between 2000 and 2007. During the same period there has also been an increase in other STIs in Sweden and worldwide [6,7,9,15,16]. Data from routine surveillance systems provide important information which is used for public health purposes. The Swedish Surveillance system of syphilis is population-based. All health care specialists have the responsibility to notify diagnosed syphilis (and other notifiable STIs) directly to the national surveillance system SmiNet. Also all laboratories diagnosing syphilis have the responsibility to notify to the SmiNet. This dual notification from clinicians and laboratory minimises the chance of underreporting of syphilis cases and data on syphilis incidence in Sweden are thus largely reliable. Some delays may occur, however, since assessment of the timeliness of notifications for syphilis and other STIs has not been performed in Sweden so far and therefore exact data on delay are not available. Some problems in the surveillance system may arise from duplicates due to coded and anonymous notification of syphilis cases. However, the medical officers in the counties in Sweden have the duty to check for duplicates and erase them from the system as they are able to obtain access to the patient's full identity from the notified clinic and laboratory. As a result we believe that duplicate reporting did not affect the presented syphilis incidence. Some other difficulties are seen in syphilis surveillance, such as, the difficulty in establishing the stage of syphilis (e.g. differentiating between early and late latent syphilis). This might affect the quality of reported cases. The health care professionals have to use their best judgement and follow the case definition (only early infectious syphilis with laboratory confirmation should be reported) to ensure the reported data provide a realistic picture of syphilis epidemiology in Sweden. Data quality in terms of data completeness varies for some variables (e.g. reported country of acquisition) and some conclusions need to be drawn with caution.

From the data obtained through the surveillance system we conclude that the major contributor to the recent rise in syphilis cases in Sweden is infections among MSM. Recently described outbreaks of syphilis and gonorrhoea among MSM showed that unsafe sex practices were more widespread among this population group in many countries and included a growing number of casual sexual partners, non-use of condoms and contact with anonymous sexual partners [6-9,17,18]. Adopted risk reduction strategies against human immunodeficiency virus (HIV) transmission referred to as "safe(r) sex" such as oral sex and choosing a partner with the same HIV status does not necessarily protect against syphilis. Among MSM who acquired a syphilis infection in Sweden in recent years, the majority acquired it in big cities, especially Stockholm (up to 96% of all reported cases among MSM). According to our estimate syphilis incidence among MSM was 20-28 times that of males in general in Sweden. It can be assumed that MSM to a larger extent choose to live in big cities since they assure more anonymity and less stigmatisation for MSM. Big cities also supply a meeting ground for sexual networks that facilitate the spread of STIs, as has been reported from other European Union countries [17-20]. A study in Sweden on risk factors for syphilis among MSM showed that current syphilis patients are 7.8 times more likely to have had syphilis in the last five years than MSM without current syphilis [21]. Also MSM with current syphilis are 3.8 times more likely to have had more than ten sex-partners in the past 12 months than MSM without current syphilis. The change in sexual behaviour with more risk-taking practices is likely to have contributed to the recent increase in STIs in Europe [9,19,20,22]. This supports the need for improved preventive work with adapted health prevention messages and education for MSM.

Another group of concern is women. Syphilis cases in females are reported mostly from the counties with big cities, such as Stockholm county and Skåne (Malmö). The increased number of infected women is worrying and suggests either novel sexual networks or a change in sexual behaviour or increased sexual contacts with bisexual men. The latter can link MSM sexual networks with heterosexual females and introduce syphilis and other less common STIs into these sexual networks as it was reported in USA [16]. Closer analysis of such behaviours and sexual networks is needed to gain a thorough insight into the matter.

The constant high number of heterosexual males who acquire syphilis abroad suggests that this is an additional group of the population which requires targeted prevention activities.

## Conclusions

The described syphilis trends in Sweden over the past eight years give insight into key features of the syphilis epidemiology: the most affected population groups are MSM and heterosexual men (especially when travelling abroad). However, reported numbers in women are rising and a cause for concern. Overall the increased incidence of syphilis and other STIs points to insufficient use of condoms and more risk-taking behaviour and possible lack of knowledge about STIs and their transmission. The findings presented in our study should guide public health professionals in planning targeted preventive campaigns.

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This article was published on 11 December 2008.

Citation style for this article: Velicko I, Arneborn M, Blaxhult A. Syphilis epidemiology in Sweden: re-emergence since 2000 primarily due to spread among men who have sex with men . Euro Surveill. 2008;13(50):pii=19063. Available online: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19063

# Reported cases of congenital syphilis in the French national hospital database

**N Nicolay (nathalienicolay@yahoo.fr)[1], A Gallay[1], A Michel[1], J Nicolau[1], J C Desenclos[1], C Semaille[1]**
1. Institut de Veille Sanitaire, St Maurice, Paris, France

In France, the resurgence of syphilis infection since the beginning of the 2000s, with cases reported among women of reproductive age is a reason for concern considering the possible occurrence of congenital syphilis (CS). Using the French national private and public hospital database, we investigated the number of children with a diagnosis of CS born in France in 2004. Six cases less than one year old were identified as probable CS in the database. Two of these cases were adopted children from outside Europe, whereas the other four were born in France. The mothers of these last four infants tested positive for syphilis during the third trimester of pregnancy, two of them during premature delivery. Three of the four mothers were born abroad. Specific socio-cultural conditions may have been responsible for a lack of antenatal care responsible for the disease. Since CS is a preventable disease and the treatment of syphilis infection is cost-effective, we conclude that surveillance of CS cases and assessment of syphilis screening practises during pregnancy should be performed to prevent the occurrence of CS cases in France.

## Introduction

Because of the availability of cost-effective treatment and better prevention of sexually transmitted infections (STI) following the emergence of HIV in the 1980s, syphilis infection had almost disappeared in western European countries by the end of the 90s [1-5]. However, since 2000, France as well as other western European countries has been facing an increasing number of syphilis cases especially among men who have sex with men (MSM), although heterosexual transmissions affecting an increasing number of women are reported too [6,7]. Neither syphilis infection nor congenital syphilis (CS) is notifiable in France. The surveillance of syphilis is based on voluntary notifications by clinicians working in STI health centres, and the burden of the disease in the general population is by consequence underestimated.

Syphilis infection among women of reproductive age can lead to CS in their children. In France, syphilis screening is mandatory and free of charge during the first trimester of pregnancy. However, in specific circumstances, pregnant women may miss antenatal care and by consequence pose a higher risk of CS for the infant due to the lack of appropriate treatment during pregnancy [8,9].

We used the national public and private hospital database, which includes information on all hospitalisations with a specific diagnosis associated to each stay, to assess the number of children with a diagnosis of CS born in France in 2004. We also attempted to identify maternal characteristics associated with the risk of CS.

## Methods

### Study design and population

We performed a retrospective cross sectional study of CS cases recorded in 2004 in the French national private and public hospital healthcare information system [Programme de Médicalisation des Systèmes d'Information (PMSI) implemented since 1999]. This database includes information on all the diagnoses made for all the patients admitted to French hospitals. Medical doctors register all hospital stays with a principal and associated diagnosis coded according to the 10th edition of the International Classification of Diseases (ICD-10) [10]. All data contained in the database are anonymous and protected by professional confidentiality.

In our study, information on hospital stays in 2004 of patients less than one year old with a principal or associated diagnosis of CS (Table 1) were extracted from the PMSI database. As some patients may have stayed in hospital several times, a unique identification number per patient in each hospital allowed us to identify all the stays related to the same patient.

### Data collection

For each diagnosis of CS identified in the PMSI database, we contacted the hospital where the patient had stayed and asked the head of the medical informatics department to collect the following information from the patient's medical records: sex, age, date of stay, clinical symptoms, serology of syphilis and place of birth of the infant and term of the pregnancy, screening of the

**Table 1**

**Codes based on the 10th edition of International Classification of Diseases (ICD-10) used for initial extraction of data on cases with diagnosis of congenital syphilis from the national hospital information system, France, 2004**

| Diagnosis | Code |
|---|---|
| Early congenital syphilis, symptomatic | A50.0 |
| Early congenital syphilis, latent | A50.1 |
| Early congenital syphilis, unspecified | A50.2 |
| Late congenital syphilis oculopathy | A50.3 |
| Late congenital neurosyphilis (juvenile neurosyphilis) | A50.4 |
| Other late congenital syphilis, symptomatic | A50.5 |
| Late congenital syphilis, latent | A50.6 |
| Late congenital syphilis, unspecified | A50.7 |
| Congenital syphilis, unspecified | A50.9 |

mother for syphilis during pregnancy, date of screening, antenatal care and treatment received for syphilis during pregnancy, and mother's place of birth. Based on these data, cases were confirmed as definite or probable early CS according to the case definition.

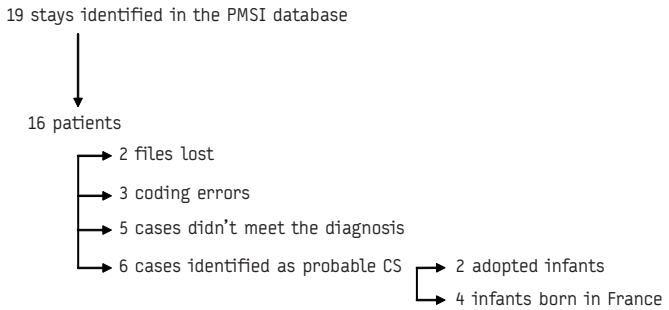
## Results

A total of 1,811 hospital stays were recorded with a diagnosis of syphilis in the PMSI database in 2004. In 113 of these CS appeared among the diagnoses coded, but only 19 hospital stays had the principal or associated diagnosis of CS. These 19 stays corresponded to 16 infants, as four stays were linked to the same patient (Figure). No medical record could be located for two patients. In three cases coding error occurred; the principal diagnosis coded was different than the principal diagnosis mentioned in the medical records. Five patients did not fulfil the case definition and were excluded.

Among the remaining six infants classified as probable cases of CS, two were adopted babies born in North Africa. The remaining four cases were born in France, two of them prematurely, including one with foetal hepatomegaly (Table 2). The mothers of these four cases were screened positive for syphilis during their third trimester of pregnancy two of them at the premature delivery. They had not received proper treatment for syphilis infection: two were not treated at all, one received only two doses of extencillin (benzathine benzyl penicillin), and the last one received three doses but starting less than 30 days before delivery. No information on syphilis screening during the first trimester of pregnancy was available for any of these four women. Additional information on social integration difficulties and undesired pregnancy was mentioned in the medical documentation of two mothers.

**Figure**

**Congenital syphilis (CS) cases identified in the PMSI database, France, 2004**




## Discussion

This original study is the first documentation of CS occurrence in France. We identified six probable early CS cases less than one year of age according to the CDC definition. None of them were confirmed CS that would have required laboratory confirmation with evidence of Treponema pallidum [11]. Among these six probable cases, two adopted infants were born outside Europe, in North Africa. Only four probable CS cases born in France were identified in the PMSI database in 2004. The CS diagnosis was made at birth for all of them. Syphilis infection among the mothers was detected or treated too late to prevent the infection in the infant.

This number may have been underestimated. Indeed, CS can occur with non-specific symptoms, or the infection can be asymptomatic at birth and the diagnosis is by consequence delayed. Among the nine children with CS reported between 1994 and 1997 in the United Kingdom [12], only three had clinical abnormalities. In our study, one of the four cases born in France had obvious clinical symptoms. Our study focused on early CS in children less than one year of age but the diagnosis of CS can be made in older children ("early" CS defined as affecting children less than two years old and "late" CS diagnosed in children older than two years). In the PMSI database, a two-year-old child and eight children aged between two and 15 years were reported with a principal or associated diagnosis of CS in 2004. These cases were not

**Table 2**

**Probable cases of congenital syphilis (CS) less than one year of age born in France identified in the PMSI database in 2004, France**

| Cases | Age | Sex | Congenital syphilis diagnosis: serologic tests and others investigations | Syphilis screening during pregnancy | Treatment of the mother during pregnancy | Place of birth of the mother |
|---|---|---|---|---|---|---|
| 1 | Newborn (reached term) | Male | +TPHA/VDRL** | +TPHA/VDRL | Two doses of extencillin given at one week intervals before delivery (at term) | East Europe |
| 2 | Premature (33 WA*) | Male | +TPHA/VDRL; +Fta-IgM | First prenatal consultation at 29 WA* with +TPHA/VDRL; undesired pregnancy | Three doses of extencillin given at one week intervals | South Europe |
| 3 | Premature (32 WA*) | Female | Foetal hepatomegaly; +TPHA/VDRL | Threat of premature delivery with admission to hospital and +TPHA/VDRL during the third trimester; pregnancy followed up by a general practitioner; no information on syphilis screening during the first trimester | Never treated | Outside Europe |
| 4 | Diagnosis made at birth (unknown week of amenorrhea) | Male | No clinical symptoms; two reactive +TPHA/VDRL at one week intervals; second titration higher than the first | +TPHA/VDRL at delivery; difficulties with social integration | Refused treatment | Overseas French district in America |

* Week of amenorrhea
**Treponemal test: *Treponema pallidum* hemagglutination test (TPHA) / venereal disease research laboratory (VDRL)

investigated. Finally, coding errors may have occurred, and cases who had never been hospitalised were missed. Also, miscarriages and cases of stillbirth due to CS were not included in the study.

Previous studies showed that CS occurs more frequently in absence of or inappropriate antenatal care [13,14]. The consequence is a late or no syphilis screening and inappropriate treatment of the mothers which fail to prevent foetal contamination [15,16]. In France, a pregnant woman should attend seven antenatal consultations, and syphilis screening must be performed during the first trimester (Décret n°92-143) [17]. Antenatal care is free of charge, the syphilis screening included. However, despite this regulation, different factors such as language and cultural barriers or an illegal administrative status can hinder pregnant women from getting appropriate medical care [8,9]. In our study, specific socio-cultural conditions may have been responsible for the lack of antenatal care: three mothers were migrants and "social integration difficulties" (but no details) were reported for the fourth one. The fact that one mother refused the treatment and one had an undesired pregnancy may be indicative of further psychosocial problems [18].

In France, like in the other western European countries, the re-emergence of syphilis especially affects MSM [6]. However, the number of infected women also increased from 11 (of the total of 207 cases of syphilis reported) in 2001 to 30 (total of 455 cases) in 2006 [6]. The contagiousness of syphilis as well as the high percentage of heterosexuals who engage in high risk sexual behaviours, such as not using condoms for oral sex (92% heterosexuals in France), may be responsible for an increasing number of syphilis cases among women. Immigrant women were identified to be at a higher risk of syphilis infection during pregnancy [19]. In France, among the 19 women with a diagnosis of syphilis notified in 2004, 13 were born in foreign countries and four were born in France (information unavailable for the remaining two women). In this context, health care practitioners should consider the option of syphilis screening at each pregnancy consultation [20,21], especially in the presence of risk factors identified above. Indeed, the French National Authority for Health (Haute Autorité de Santé - HAS) recommends another syphilis screening performed before 28 weeks of gestation when the woman or her partner has high risk sexual behaviour. Finally, a lack of syphilis screening during pregnancy should result in performing serology at birth to avoid late diagnosis of CS [21].

Despite their limits, data from PMSI can be used to describe the annual trend of CS cases, but not to perform a prospective follow up as the data are available with a minimum delay of three years. In France, the very low number of CS cases suggests that the antenatal care system is efficient. However, because of the overall increasing incidence of syphilis infection the French gynaecologists, obstetricians and paediatricians should be aware of the risk of CS, especially among women belonging to specific under-privileged groups, and should double check at delivery whether and how the screening was performed during pregnancy. A prospective notification of CS cases by maternity or paediatric wards with an investigation of each case should allow to better characterise the circumstances of syphilis infection before or during pregnancy and the performance or the absence of syphilis screening. These information may improve the prevention and the treatment of CS in the population at risk. This strategy is necessary taking into consideration the severity and the burden of CS avoidable with a simple cost effective treatment.

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This article was published on 11 December 2008.

Citation style for this article: Nicolay N, Gallay A, Michel A, Nicolau J, Desenclos JC, Semaille C. Reported cases of congenital syphilis in the French national hospital database. Euro Surveill. 2008;13(50):pii=19062. Available online: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19062

# An international outbreak of Shiga toxin-producing *Escherichia coli* O157 infection due to lettuce, September – October 2007

**I Friesema (ingrid.friesema@rivm.nl)[1], G Sigmundsdottir[2,3], K van der Zwaluw[1], A Heuvelink[4], B Schimmer[1], C de Jager[1], B Rump[5], H Briem[2], H Hardardottir[3], A Atladottir[2], E Gudmundsdottir[6], W van Pelt[1]**

1. Centre for Infectious Disease Control, National Institute for Public Health and the Environment (RIVM), Bilthoven, The Netherlands
2. Directorate of Health, Centre for Health Protection and Communicable Disease Control, Reykjavik, Iceland
3. Department of Clinical Microbiology, Landspitali University Hospital, Reykjavik, Iceland
4. Food and Consumer Product Safety Authority, Zutphen, The Netherlands
5. Municipal public health service Hollands Midden, Leiden, the Netherlands
6. Food division, Environment and Food Agency, Reykjavik, Iceland

Between 14 September and 20 October 2007, an outbreak of Shiga toxin-producing *Escherichia coli* (STEC) O157 simultaneously occurred in the Netherlands and Iceland. A total of 50 laboratory-confirmed cases were reported with a STEC O157 infection caused by the same clone. The strain was of type O157:H-, PT8, positive for $stx_1$, $stx_2$, *eae* and *e-hly*, and sorbitol negative. The most probable cause of this international outbreak was contaminated lettuce, shredded and pre-packed in a Dutch food processing plant. Samples of the environment, raw produce and end products, taken at several vegetable growers and processing plants all tested negative for STEC O157. However, the only epidemiological link between the cases in the Netherlands and in Iceland was the implicated Dutch processing plant. In Europe, food products are often widely distributed posing the risk of potential spread of food borne pathogens simultaneously to several countries. This international outbreak emphasises the importance of common alert and surveillance systems in earlier detection of international outbreaks and better assessment of their spread.

## Introduction

Infections with Shiga toxin-producing *Escherichia coli* (STEC) typically present as diarrhoea which can range from mild and watery to bloody (haemorrhagic colitis). The infection can progress to haemolytic uremic syndrome (HUS), a serious condition that can result in death [1,2]. Children under 10 years of age with a verified STEC infection have approximately 15% risk of developing HUS [3]. The serotype most often associated with severe disease is STEC O157:H7, but many other serotypes are also known to cause symptoms [4-6].

A great majority of STEC O157 outbreaks can be traced back to ruminants, especially cattle [7]. Numerous studies have been done on faecal excretion of STEC O157 from cattle to estimate the carriage rate of STEC [7]. All agree that faecal excretion exists, although the rate found varies. Inevitably, contact with farm animals has been reported as a source for STEC outbreaks [8,9]. Spreading of cattle manure over land or in water can contaminate water and produce, and meat can be contaminated in the slaughterhouse or later in the production process. Water [10,11] and food products [12], such as meat [13-15], dairy products [16-18], and fresh produce [19,20] are therefore often reported as sources of outbreaks caused by STEC O157.

In September-October 2007, national outbreaks of STEC O157 infection occurred simultaneously in the Netherlands and Iceland, of which preliminary reports were published in November 2007 [21,22]. As the isolates of STEC O157 from the patients of both outbreaks had an identical and unique pulsed-field gel electrophoresis (PFGE) pattern, a common source was suspected. In the present report, we have combined the results of the outbreak investigations done in both countries into one description of the international outbreak, with lettuce as the most probable cause.

## Methods

### The Netherlands

Since 1999, an enhanced laboratory-based surveillance of STEC infections has been implemented in the Netherlands. This means that all Dutch medical microbiological laboratories are required to send STEC isolates to the National Institute for Public Health and the Environment (RIVM) for O- and H-typing. The isolates are also tested for genes encoding Shiga toxin type 1 and type 2 ($stx_1$ and $stx_2$), the *E. coli* attaching-and-effacing gene (*eae*) and the haemolysin encoding EHEC-*hly* gene (*e-hly*). DNA fingerprints are made by PFGE, using *Xba*I as the restriction enzyme. The fingerprints are processed with BioNumerics® (Applied Maths, Kortrijk, Belgium; Dendrogram type=UPGMA, Similarity coefficient=Dice).

Additionally, as part of the surveillance, municipal health services contact every laboratory-confirmed STEC patient in the Netherlands to collect information about clinical symptoms and exposures to known risk factors in the week before illness onset using a standardised questionnaire [23,24]. When a marked increase in the numbers of reported STEC cases was observed in the end of September 2007, in addition to the standard questionnaire a special outbreak questionnaire was designed, providing more detailed information on consumption of meat, dairy and raw

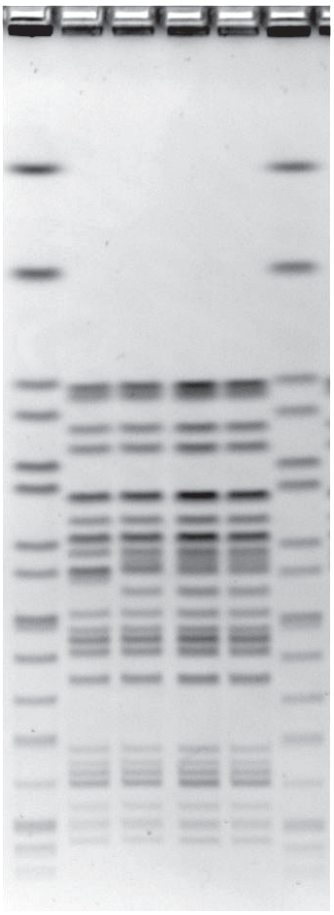
vegetables and contact with farm animals and manure. All cases with onset of symptoms after 1 September 2007 were asked to complete both questionnaires.

An outbreak-related case was defined as having an isolate matching the outbreak fingerprint for at least 95% and the date of onset of symptoms later than 1 September 2007. A case-case comparison was made between non-outbreak cases of the enhanced surveillance (1999-2007) and the outbreak-related cases using the standardised questionnaire.

When lettuce was suggested as a possible source, the Dutch Food and Consumer Product Safety Authority (VWA) started investigating the distribution channels of packed fresh vegetables and the individual ingredients, and visited several vegetable producing and processing companies. During these visits, samples of the environment, raw produce and end products were collected and tested for STEC O157. During the visit of VWA at one of the processing plants, it was noted that during the outbreak period a high number of workers had been absent due to illness. The municipal health service visited the plant shortly afterwards to gather additional information on the symptoms and to collect stool and blood samples from those who had been ill. Blood samples were tested for the presence for antibodies against LPS O157 using ELISA and immunoblotting [25].

FIGURE 1

**Pulsed-field gel electrophoresis (PFGE) pattern of the outbreak strain (middle four lanes) and the reference H9812 *S. Braenderup* (both side-lanes), international outbreak of Shiga toxin-producing *Escherichia coli* (STEC) O157 in Iceland and the Netherlands, September-October 2007**



### Iceland

In Iceland, STEC infections are subject to mandatory notification which requires laboratories and treating physicians to report cases without delay. When a clear rise in the number of domestically acquired STEC O157 infections was observed in early October 2007, an outbreak investigation was initiated.

The case definition used for the outbreak investigation included all domestically acquired STEC O157 infections with onset of symptoms after 1 September 2007, pending PFGE and testing for $stx_1$ and $stx_2$ genes. A trawling questionnaire on food consumption, mass gathering and travel as well as purchase records from two weeks prior to onset of infection were collected from cases.

In Iceland, detection of STEC O157 is carried out only by the reference laboratory which performs DNA fingerprinting with PFGE, using *Xba*I as the restriction enzyme. Testing for $stx_1$ and $stx_2$, however, is not done in Iceland therefore isolates were sent to the Laboratory of Enteric Pathogens at the Health Protection Agency (HPA) in the United Kingdom for detection of these genes.

The food division of the Environment and Food Agency in Iceland is responsible for surveillance in food and when results from the trawling questionnaire and purchase records were available, surveillance of lettuce was intensified with increased sampling.

### Results

On 11 October 2007, Iceland notified other European countries about the ongoing outbreak of STEC O157 through the urgent inquiries system of the European Food and Waterborne Diseases Network administered by the European Centre for Disease Prevention and Control (ECDC). When the Netherlands responded by reporting a similar outbreak, contact between these two countries was established and information exchange was facilitated. PFGE patterns of the first set of STEC isolates from cases in both countries were available for comparison on 22 October revealing identical fingerprints and a definite link between the two countries. The PFGE-pattern is shown in Figure 1.

In total, isolates from 48 cases from both countries had identical PFGE patterns. This pattern had not been observed previously in either of the two countries or the rest of Europe. Isolates from two other individuals generated a PFGE pattern that matched the outbreak pattern in 95-97%. Both patients were included as cases, resulting in a total number of 50 cases. The distribution of these cases by date of symptom onset is shown in Figure 2. Forty-seven cases (94%) reported diarrhoea, including 41(87%) with bloody diarrhoea. No cases of HUS were reported.

Twelve cases, seven males and five females, were regarded as secondary cases, as they most likely had contracted the infection from another case. Six of them were children aged 0-8 years, and six were adults aged 34-82 years.

The 38 primary cases included 21 females and 17 males. Their median age was 24.5 years (range 1-74 years), and about half of

the cases were aged between 10 and 30 years. The detailed age and sex distribution of the primary cases is shown in Figure 3.

**The Netherlands**

In the Netherlands, the annual number of STEC cases reported between 1999 and 2006 ranged from 32 to 57. In the end of September 2007, a marked increase in the number of reported cases was noted. An outbreak of STEC O157 was identified including 41 cases with dates of symptom onset between 14 September and 20 October 2007, of whom 31 were primary cases, and ten were secondary cases. Thirteen patients were admitted to hospital; in two cases information on hospitalisation was missing. All 41 isolates were of serotype O157:H-, contained $stx_1$, $stx_2$, *eae* and *e-hly* genes, and were sorbitol negative.

Answers to at least one of the two questionnaires were available for 29 of the 31 primary cases. Descriptive epidemiology suggested a link between STEC infection and consumption of lettuce as 25 cases (86%) reported eating lettuce in the week before illness. Comparison of the standard questionnaire results for the outbreak-cases with those of the sporadic cases of the surveillance showed highest odds ratios for pre-packed lettuces: 4.41 (95% confidence interval 1.91-10.19) compared to the sporadic cases of 1999-2007, and 7.33 (95% CI 2.19-24.50) compared to the sporadic cases of 2007.

A total of 99 environmental and food samples taken at the vegetable producing and processing plants were tested and found negative for STEC O157. In one company, which exported pre-packed lettuce to Iceland, a total of 32 employees had been on sick leaves because of gastroenteritis during the outbreak period. However, faeces and blood samples of these workers tested negative for STEC O157 and interviews with them suggested that the clinical presentation was more compatible with a norovirus outbreak than with STEC O157 infection.

**Iceland**

In Iceland, only up to two cases of STEC infection had been reported annually in the 10-year period preceding 2007 (with the exception of four cases notified in 2004), and no outbreak had ever been detected. In the outbreak in 2007, nine cases were identified with onset of symptoms between 23 September and 18 October. Seven cases were considered primary cases and two were secondary cases. Seven patients were hospitalised.

The isolates from the first three cases were sent to the Laboratory of Enteric Pathogens at the HPA in the United Kingdom and were identified as STEC O157, phage type 8, carrying the $stx_1$ and $stx_2$ genes with a PFGE pattern identical to the pattern for the Dutch strains. PFGE done on all nine isolates at the Department of Microbiology at Landspitali University hospital revealed a pattern identical to the pattern from HPA.

The seven primary cases lived in different parts of the country: three cases resided in the capital area, two in the northern part of the country, one in the eastern part and one on the Westman Islands. It was clear that the product that had caused the infection had been widely distributed.

Eight cases (seven primary) answered the trawling questionnaire and two primary cases provided purchase records. Results from the outbreak questionnaire showed that six of the seven primary cases had consumed either fish or sliced precooked ham. But since these products originated from different producers or local fishermen, they were considered to be an unlikely source of the outbreak. The purchase records and the outbreak questionnaire also revealed that five of the seven primary cases had consumed ready-to-eat lettuce mixtures of one brand pre-packed in and imported from the Netherlands. However, of the 80 samples of lettuce collected between 22 October and 5 November none tested positive for *E. coli* O157.

## Discussion

Between mid-September and mid-October 2007, in Iceland and the Netherlands a total of 50 patients were diagnosed with a STEC O157 infection caused by the same strain. The actual number of cases may have been considerably higher seeing that infections with STEC O157 may pass uncomplicated or even symptom-free, especially in adults [26,27], and those affected do not seek medical help and are not tested for STEC O157. No HUS-cases have been reported in the outbreak. The age of the cases is probably a relevant indication of the cause, as only three of the 38 primary cases and five of the 12 secondary cases were younger than five years.

**Figure 2**

**Epidemic curve of the international outbreak of Shiga toxin-producing *Escherichia coli* (STEC) O157 in Iceland and the Netherlands, September-October 2007, by date of onset of symptoms (n=50)**

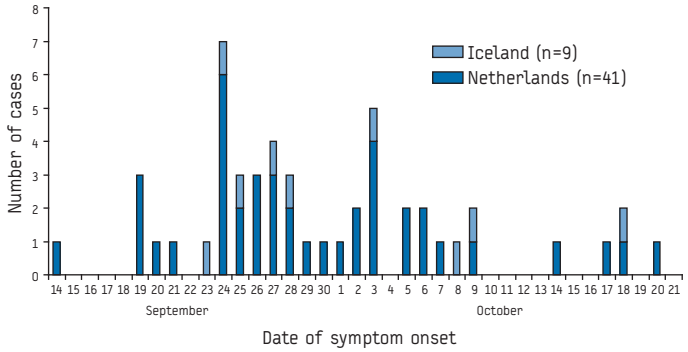
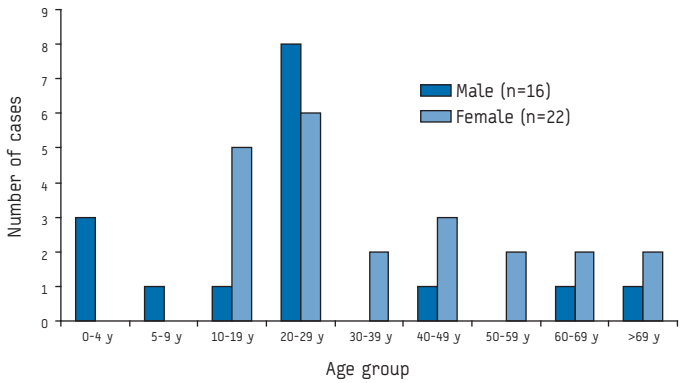



**Figure 3**

**Age and sex distribution of all primary cases of Shiga toxin-producing *Escherichia coli* (STEC) O157 related to the international outbreak in Iceland and the Netherlands, September-October 2007 (n=38)**



The most probable cause of this international outbreak was contaminated lettuce, shredded and pre-packed in a Dutch food processing plant. Packages with several combinations of different types of lettuce but belonging to the same brand imported from the Netherlands were reported by the cases. Contamination of lettuce can occur either during growth by the application of water, soil or manure contaminated with animal faeces or as a result of cross-contamination during processing, for example through contaminated transport containers, human transmission or in the shredding process. However, microbiological evidence pointing to the source of this outbreak was not found. Furthermore, none of the workers of the implicated food processing plant tested positive for STEC O157 infection. It is likely that the contamination had already faded out at the time samples were taken at the food producing and processing plants and that contaminated products had not been present in the supermarkets anymore. The sampling started in mid-October, which is around the date the last cases had onset of symptoms.

The outbreak highlights the importance of fresh produce as a vehicle in STEC infections. Although it has been shown that lettuce can become infiltrated by *E. coli* O157 making it impossible to wash off [28], in most cases the bacteria stay on the surface of the leafs. However, the fact that salad vegetables are usually eaten raw is compounded by the increase in popularity of pre-packed salad products that are unlikely to be washed by the consumer. In one outbreak caused by lettuce, the wash water used by the grower was the most likely source of contamination, as it contained *E. coli* O157:H7 [29]. Contaminated water was also suspected as the source in an STEC O157 outbreak related to iceberg lettuce in Sweden, although no microbiological evidence was found [30]. The trace-back investigation in another lettuce outbreak in the United States implicated two possible sources: one at a local farm and another in six farms shipping under the same label [31]. Microbiological evidence could not be established, so the transmission route remained unclear.

Food products are widely distributed within the European Union (EU) and from and to countries outside the EU thus creating the potential for the spread of food borne pathogens simultaneously to several countries. This international outbreak emphasises the importance of common alert and surveillance systems in the EU for earlier detection of international outbreaks and better assessment of the size and the spread of such outbreaks. The e-mail urgent inquiries system of the European Food and Waterborne Diseases Network administered by the ECDC has proven its value to detect similar outbreaks occurring simultaneously in more than one country. In this outbreak, the link to Dutch lettuce products was suspected two weeks after the first e-mail informing about the cases in Iceland. As both countries promptly joined forces, direct action by the Dutch food authorities could then be taken, which shows the added value in joint outbreak investigation within the EU. Analysing compiled data when possible and collecting supporting findings from more than one country, at the same time increases the possibility to detect potential sources at an earlier stage and strengthens the epidemiological evidence. Thus, cooperation allows for earlier implementation of actions aimed at identifying and eliminating the source of infections and therefore contributes to the decrease of both morbidity and mortality due to communicable diseases within the EU.


## Acknowledgements

The authors would like to thank the Laboratory of Enteric Pathogens at the HPA in the United Kingdom for typing the STEC strains from Iceland. Furthermore, the authors would like to thank Olaf Stenvers and Enne de Boer from the VWA and Daan Notermans, Rob de Jonge, Sjoerd Kuiling and Iris van Ouwerkerk from the RIVM for their assistance. Also, a word of thanks to T van der Velden and NCAJ van de Kar, from Department of Paediatric Nephrology, Radboud University Nijmegen Centre, St Radboud, the Netherlands, for performing the blood tests.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This article was published on 11 December 2008.

Citation style for this article: Friesema I, Sigmundsdottir G, van der Zwaluw K, Heuvelink A, Schimmer B, de Jager C, Rump B, Briem H, Hardardottir H, Atladottir A, Gudmundsdottir E, van Pelt W. An international outbreak of Shiga toxin-producing Escherichia coli O157 infection due to lettuce, September – October 2007. Euro Surveill. 2008;13(50):pii=19065. Available online: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19065

# Meeting reports

## Ethical and legal issues related to health access for migrant populations in the Euro-Mediterranean Area

**E Negro Calduch (enegro@isciii.es)[1], A Diaz[1], M Diez[1], for the project "Impact of migration on HIV and TB Epidemiology in the Mediterranean Area"[2]**

1. HIV/AIDS Epidemiology Unit, Secretariat of the National Plan on AIDS, Directorate of Public Health and Border Health and National Epidemiology Centre, Instituto de Salud Carlos III, Madrid, Spain
2. http://www.sante.gov.ma/Departements/INH/WorkshopTBHIV/index.htm

The Institut National d'Hygiène (Morocco) and the Instituto de Salud Carlos III (Spain) are involved as a consortium in a project called "Impact of migration on HIV and TB Epidemiology in the Mediterranean Area", funded by the Sixth Framework Programme for research of the European Commission. The project started in May 2007 and is intended as a specific support action to promote international research cooperation in the Euro-Mediterranean area. In particular, its objective is to improve the capacity of the countries around the Mediterranean Basin for obtaining quality epidemiological information on human immunodeficiency virus (HIV) and tuberculosis (TB) among migrants, while taking into consideration ethical and legal issues related to health in migrant populations. To this end, the project proposed to hold two workshops to bring together all the relevant stakeholders: delegates of international and national non-governmental organisations (NGOs) concerned with the process, experts and health professionals, researchers, representatives of the United Nations Agencies and other decision makers.

The first workshop was dedicated to reviewing epidemiological and laboratory issues and was held in Rabat (Morocco) in November 2007. An account of the main issues covered at this workshop has been published [1].

France, Italy, Mauritania, Morocco, Portugal, Spain and Tunisia were represented at the second workshop, which took place in Madrid from 25 to 27 June 2008. This second workshop was intended to provide an overview on the ethical and legal issues related to health in migrant populations, contributing to the Euro-Mediterranean dialogue on the situation of migrants. In addition, it aimed at determining the specific requirements to be taken into consideration when trying to improving the epidemiologic surveillance of HIV and TB in migrant populations.

The workshop was organised around four main topics:

a) Migrants and health: ethical and legal issues;
b) Access of migrants to prevention and care for HIV and TB;
c) Stigma and discrimination;
d) The way forward: role of different stakeholders in improving health care and health information in migrants.

A summary of the discussions on those topics during the Madrid meeting are provided below.

### Migrants and health: ethical and legal issues

The right to health, regardless of the legal status of individuals, is recognised widely in the different legislative frameworks, both at international and national level.

In the international context, the most important regulations on immigration and health matters are: the WHO Constitution (1946) [2], the Universal Declaration on Human Rights (1948) [3], the International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families (1990) [4], the International Labour Organization (ILO) Conventions 97 and 143 [5], the Declaration on the Human Rights of Individuals who are not Nationals of the Country in which they Live (1985) [6], the Convention relating to the Status of Refugees (1951) [7] and the Guiding Principles on Internal Displacement (1998) [8]. Those conventions have been ratified by most countries in the world, including those belonging to the European Union (EU) and the Mediterranean region. In addition, national legislation recognising the right to health as a fundamental human right exists in Euro-Mediterranean countries. Furthermore, the Council of Europe has recognised the right of everyone to attainable standards of physical and mental health and the right to receive health care in the event of sickness and pregnancy. Moreover, any legislation or practice that denies the provision of medical assistance to foreign nationals within Europe, even if they are undocumented, is contrary to the European Social Charter [9].

Given the legal framework, policy options that contravene the United Nations and European conventions should not be pursued in the Euro-Mediterranean area, and current legislation should be enforced and implemented. Nevertheless, it is unclear how immigrants, especially undocumented, receive health care in case of need in many countries of the area.

### Access of migrants to prevention and care for HIV and TB

Early detection and treatment of HIV and TB in foreign-born individuals in the host country has proved to have an enormous potential public health benefit.

The rationale for treating people living with HIV/AIDS (PLWHA) with highly active anti-retroviral therapy (HAART) or TB patients with anti-TB drugs is based both on human rights and public health protection grounds. HAART decreases HIV-related morbidity

and mortality, enabling infected people to remain socially and economically active, and reduces the infectivity of PLWHA, thus becoming an important prevention instrument for HIV transmission [10, 11]. Likewise, treating TB patients, apart from the individual beneficial impact, is the most important TB control measure [12].

The provision of health services for TB and HIV patients is obviously subject to certain economic considerations. For this reason, cost-effectiveness analyses of HIV and TB treatment have been carried out in different settings, concluding that both interventions are cost-effective.

There are great variations in self-perceived health and utilisation of health services both among migrant populations coming from other countries and migrant groups from different parts of the same country. Thus, migrant populations are heterogeneous and should not be considered as one entity. In addition, undocumented migrants may be less likely to regularly attend health services for fear of legal actions against them. In this respect, some studies have shown that, contrary to many health professionals' and the general public's perception, migrants tend to utilise healthcare services less than nationals [13].

Access of migrants to health services might be particularly difficult in the event of incarceration. Some countries like Spain have shown that it is possible to implement prevention programmes for TB and HIV, including syringe exchange programmes, in prisons. Health policies should guarantee that prisoners and non-prisoners receive equal conditions regarding prevention and healthcare services provided, and that migrants have access to them on the same basis as nationals.

On the subject of HIV and TB screening, additional considerations must be taken into account, since affected individuals can be exposed to stigma and ostracism that might be compounded by compulsory health screening. Screening of migrants for TB and HIV is carried out in many countries, but the evidence base in support of this policy is weak. Compulsory screening is expensive in terms of both start-up and recurring costs and, once implemented, is difficult to halt. Resources allocated to compulsory screening might be more effectively directed into providing better health care and preventive services [14, 15].

NGOs operating in the Euro-Mediterranean area include among their activities free healthcare services for migrants such as screening, counselling, information on healthcare access and prevention services. The vulnerability of migrant populations has been stressed by these NGOs. Migrants need to be reached and constructively engaged into community activities, taking into account their social and cultural characteristics. It is necessary to remove all the obstacles that migrants face when it comes to accessing prevention and health care.

### Stigma and discrimination

Migrant populations around the world are likely to experience stigma and discrimination, in particular illegal migrants.

In addition, there is evidence indicating a growing "feminisation" of the migration phenomenon. Many women are forced to migrate due to discrimination and lack of opportunities in their countries of origin and those who are in low-skilled jobs or working illegally, especially in unregulated sectors such as domestic employment, are at a greater risk to suffer from violence, poor working conditions, long working hours, sexual exploitation and poor reproductive health. In Spain, migrant women from low-income countries have the worst health indicators, according to the "First Report on Inequalities and Health in Andalusia" [16]. To tackle social and gender discrimination, a coherent and integrated approach through health and social policies should be implemented.

Discrimination and stigmatisation is one of the dramatic consequences PLWHA have to face and a major obstacle to prevention and care. Fear of discrimination and stigma causes people to avoid testing and prompts those infected with and affected by HIV/AIDS to remain silent, depriving them from essential treatment and social care. These problems are perhaps magnified by the existing taboos regarding sexuality, affecting more intensively women.

### The way forward: role of different stakeholders in improving health care and health information in migrants

The unprecedented scale of migration to Europe for reasons of protection, employment and family reunion poses many opportunities and challenges. This is an area of policy making which is moving fast and involves many different stakeholders at the international, national and local level. In that respect, NGOs play an important role in providing socio-sanitary assistance to populations with difficult access to healthcare and in the emergency and humanitarian reception of undocumented migrants.

Public administrations in the host country must find solutions to cope with growing migration and arising needs, adapting existing health systems to the new situation [17]. For this purpose, it is important to study the health status, health needs and healthcare service utilisation of migrant populations. Similarly, it is necessary to know health professionals' perceptions and needs regarding the provision of healthcare to these populations.

At the international level, the International Organization for Migration (IOM) is the leading inter-governmental organisation in the field of migration and is dedicated to promoting humane and orderly migration. It does so by providing services and advice to governments and migrants. IOM acts at a political and operative level, working to achieve consistent immigration policies, to reduce vulnerability and improve migrants' health.

At the local level, health professionals play a fundamental role in improving healthcare and health information for migrants. Apart from difficulties in healthcare access, some concerns related to healthcare provision have been reported, such as language and cultural barriers, administrative problems and difficult diagnosis, treatment and follow-up. Institutional support is needed to improve this situation. The role of cultural mediators is particularly important in order to facilitate the relationship between nationals and migrants and promote reciprocal knowledge.

Europe is witnessing increases in migrant-associated TB and HIV, and these are important public health challenges. Migration cannot be avoided as long as economic differences prevail between the industrialised and the poor countries. The strongest policy instruments should be used to tackle this truly global issue at the appropriate levels. An example of best practice that should be built on across the EU and the Mediterranean region would be the provision of HIV and TB healthcare and preventive services to

migrants, documented or undocumented, on the same basis as to nationals of the host countries. Networking of people working on migrant issues and development of common definitions and procedures is necessary to improve knowledge on the subject.

The workshop was organised by the HIV/AIDS Epidemiology Unit of the Secretariat of the National Plan on AIDS/Instituto de Salud Carlos III, Madrid and funded by DG RESEARCH of the European Commission. The speakers were: Rajae El Aouad (project coordinator, National Institute of Hygiene, Morocco), Mercedes Diez (project co-researcher, HIV/AIDS Epidemiology Unit of the Secretariat of the National Plan on AIDS/Instituto de Salud Carlos III, Spain), Enrique Acín García ( General Directorate of Health in Prisons, Spain), Josefina Alventosa (Asociación deJuristas del Sida (JURISIDA), Spain), Delphine Antoine (Institut de Veille Sanitaire, France), Henrique Barros (Coordenação Nacional para a Infecção VIH/sida, Portugal), Eddy Beck (UNAIDS, Switzerland), Aziza Bennani (National programme for HIV, Morocco), Nadia Bezad (Pan African Organization Against Aids, Morocco), José Chamizo (Defensor del Pueblo, Andalucía, Spain), Almudena Echevarría (Cruz Roja Española, Spain), Amine Ezzahri (Ministry of Health, Morocco), Mariam Fadlou- Allah (Association de Lutte Contre le Sida, Morocco), Diego Gracia Guillén (Universidad Autónoma de Madrid, Spain), Jamila Lamani (Association de Lutte Contre le Sida, Morocco), Rogelio López-Vélez (Tropical Medicine & Clinical Parasitology. Hospital Ramón y Cajal, Spain), Tona Lizana Alcazo (Catalonian Health Department), Claudia Natali (International Organization for Migration, Switzerland), Paola Pace (International Organization for Migration, Switzerland), Tullio Prestileo ( ANLAIDS, Italy), Anna Rodés Monegal (Tuberculosis Programme, Generalitat de Catalonia, Spain), Elena Rodríguez (Universidad del País Vasco, Spain), Ali Sadiq (Department of immigration and border surveillance, Morocco), Ahmed Zekri (Mohammed V University Agdal, Morocco. More information available at: http://www.sante.gov.ma/Departements/INH/WorkshopTBHIV/index.htm).


## Acknowledgements

The authors gratefully acknowledge the contribution of all participants of the second workshop of the project "Impact of migration on HIV and TB Epidemiology in the Mediterranean Area" and the financial support of the European Commission through the VI Framework Programme for Research (FP6) of DG RESEARCH.


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This article was published on 11 December 2008.

Citation style for this article: Negro Calduch E, Diaz A, Diez M, for the project "Impact of migration on HIV and TB Epidemiology in the Mediterranean Area". Ethical and legal issues related to health access for migrant populations in the Euro-Mediterranean Area. Euro Surveill. 2008;13(50):pii=19061. Available online: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19061

# Concerted international response to control ongoing cholera epidemic in Zimbabwe

**Editorial team (eurosurveillance@ecdc.europa.eu)**[1]
1. European Centre for Disease Prevention and Control, Stockholm, Sweden

Zimbabwe is grappling with a cholera outbreak of unprecedented proportions. As of 9 December, 16 141 suspected cases of cholera have been recorded since August this year, with 775 resultant deaths and a case fatality rate of 4.8%. Cases have been reported in two-thirds of the country's 62 districts [1].

This largest cholera outbreak in the modern history of Zimbabwe is unfolding against a background of a complex political and economic crisis, with a deteriorating healthcare system weakened by lack of resources and staff strikes. A major triggering factor has been the lack of clean water because the state-run water company has run out of aluminium sulphate, a chemical used for water purification, and often water cannot be boiled because of erratic electricity supplies.

There is also a danger of cholera spreading into neighbouring countries. As of 2 December, 468 cholera cases and nine related deaths had been recorded by South African health authorities, most of them near the border to Zimbabwe [2].

On 3 December, the Zimbabwean Minister of Health and Child Welfare launched an appeal for international humanitarian aid. This has met with a widespread response from a host of diverse organisations such as the World Health Organization (WHO), the United Nations Children's Fund (UNICEF), the International Organization for Migration, OXFAM, Médecins du Monde, Médecins sans Frontières, the international non-governmental organization GOAL, Save the Children, and many others. The participants have established a comprehensive and coordinated operational plan in the hope of bringing the outbreak rapidly under control.

WHO is establishing a cholera control and command centre and seeking donor support for its cholera response plan. Regarding the spread of cholera, WHO does not recommend any special restrictions on travel or trade to or from affected areas, but encourages neighbouring countries to strengthen their active surveillance and preparedness systems [3].

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This article was published on 11 December 2008.

Citation style for this article: Editorial team. Concerted international response to control ongoing cholera epidemic in Zimbabwe. Euro Surveill. 2008;13(50):pii=19064. Available online: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19064