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HIV/AIDS and other STI in men who have sex with men – a continuous challenge for public health

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World Aids Day provides a good opportunity to take stock of the status of the HIV/AIDS epidemics in Europe and to reflect on achievements made and ongoing challenges. As shown in a rapid communication in this week's special issue of Eurosurveillance, HIV and AIDS remain a threat to public health in the European Union (EU) and the European Economic Area (EEA). Nearly 26,000 newly diagnosed HIV cases were reported for 2008 by the EU and EEA countries [1]. The growing number of new cases of HIV infection presents a burden to public health, health care systems, clinical services and the patients themselves. Over twenty-five years into the epidemic, patterns in Europe have not changed and men who have sex with men (MSM) remain the group most affected. A special issue of Eurosurveillance published on 26 November and 3 December, brings together a number of articles that address the most important issues related to HIV and sexually transmitted infections (STI) in MSM. There is accumulating evidence that the number of newly diagnosed HIV cases among MSM has been increasing in recent years, including recently acquired and acute infection [2].

Monitoring of risk behaviour is of crucial importance for obtaining relevant information on the context of in which HIV transmission occurs. European study by Elford *et al.* showed that 14 EU/EEA countries had a system for behavioural surveillance among MSM while additional four conducted behavioural surveys or similar studies in this subpopulation [3]. There is a consensus on the use of common main behavioural indicators such as unprotected anal intercourse, condom use, number of partners, HIV testing; while specific indicators vary considerably across countries. These results demonstrate a clear need for harmonisation of methods and indicators to obtain comparable data in Europe.

Monitoring of risk behaviour provides evidence of the effects of specific preventive interventions, especially when this information is collected linked with data on the prevalence of HIV and STI. For instance, the risk reduction strategy used by some MSM to have unprotected anal intercourse with casual partners with known HIV status does present a risk for STI transmission and undoubtedly has contributed to the recent increases of hepatitis C and STI co-infections among HIV-positive MSM [4-7].

The overall increase in proportion of men who engage in sexual risk behaviour such as unprotected sex with casual partners presented in several articles in this issue is of concern but confirms previous studies from Denmark and the United Kingdom [8-11]. Additional evidence of risk behaviour among MSM follows from a virological study by Cuevas *et al.* who showed that HIV cases in MSM could be frequently grouped in large transmission clusters whereas clusters detected in heterosexual patients were mostly two-person clusters [12].

The study by Folch *et al.* also demonstrates the circumstances in which unprotected anal intercourse is more likely to happen with casual partners. It is associated with the use of different drugs, a large number of sexual partners, the use of the internet to meet sexual partners, and low self-esteem. The authors showed that men who found it difficult to live with their homo/bisexuality were more likely to have unprotected sex with casual partners, putting themselves at risk for STI and HIV [8].

Serosorting can be a strategy to reduce HIV transmission however it also carries an important risk as often the serostatus is assumed. Also, the perception of one's own serostatus may be false, as suggested by Velter *et al.*, as a fraction of the MSM who believe to be HIV-negative could in fact be infected [9]. Serosorting could in fact contribute to the risk of HIV transmission as was shown in other studies as well [13,14].

The use of serosorting was shown to be more prevalent among HIV-negative than among HIV-positive men in France [9]. Serosorting was associated with having less partners and lower level of drug use in HIV-negative men. In HIV-positive men serosorting was associated with the use of the internet to meet sexual partners and was less frequent among those who used cruising venues. The internet is a relatively new tool for MSM to meet sexual partners and for researchers to recruit MSM for behavioural surveys. It has proven to be useful for research purposes as large sample sizes at relatively low costs can be obtained in the context of a lacking proper sampling frame for MSM. The disadvantage is that samples recruited via the internet may not be representative for the MSM population and tend to overestimate the true risk of STI and HIV in the population [3].

A study in six cities in Southern and Eastern Europe shows that the HIV prevalence rates range between 17% in Barcelona,5% in Bucharest and Ljubljana, and 3% in Prague. The low prevalence in Eastern European cities is encouraging; however, the Mirandola et al also report a high level of risk behaviour and lower frequency of HIV test seeking behaviour, suggesting that there is a clear potential for increased HIV transmission [15]. HIV testing is an important indicator of the health care system's ability to reach MSM and to efficiently provide access to screening. In their study a lower access in Eastern European cities is reported as compared with Southern European cities. Maintaining lower levels of HIV

among MSM require continued preventive efforts. This is also the conclusion of Tripathi *et al.* who describe high-risk behaviour in MSM and diversity in knowledge on HIV transmission for Estonia, a country with a high prevalence of HIV infection in injecting drug users [16].

Several studies in the Eurosurveillance special issue describe trends in concurrent STI and HIV among men who have sex with men. The number of syphilis cases among MSM has increased considerably in Western European countries in the past decade but Savage et al suggest that MSM in Central Europe are becoming an important risk group as well [17]. This finding is consistent with the report from Slovenia by Klavs et al which describes increasing trends of syphilis and HIV among MSM [18]. An increasing number of lymphogranuloma venereum (LGV) cases has been recently reported by several Western European countries, with close to 80% of cases being HIV-positive [19]. The slowly evolving LGV epidemic among HIV-positive MSM poses questions regarding risk factors and acquisition of infection.

Increasing trends in HIV among MSM are reported by Sasse and Defraye for Belgium [20], Semaille *et al.* for France [21], and by Diaz *et al.* for Spain [22]. Although this could be due to increased HIV testing, it is shown in Belgium that the number of tests has remained stable over time [20]. In France, about 50% of the newly diagnosed HIV infections in MSM in 2003-2008 were recently infected and high rates of co-infection with syphilis and LGV were reported [21]. On the other hand, data from Belgium and Slovenia show that a considerable proportion of HIV-positive MSM are diagnosed late (CD4 < 200 or AIDS diagnosed within three months). It is of concern that many HIV diagnoses take place during STI consultation (11% of the new HIV diagnoses in Belgium). The Belgian authors suggest implementing behavioural surveillance and qualitative research to improve effective prevention campaigns [20]. Similar conditions are described in the paper from Spain which shows high HIV prevalence rates among syphilis patients, highlighting the importance of the availability of information on HIV and STI co-infections, as this is usually not covered by the national surveillance system for HIV and STI [22].

Simultaneous infection with HIV and STI affects the progression and treatment of both HIV and other STI [23,24]. Co-infection with hepatitis poses serious clinical complications, HIV/HCV co-infection is associated with lower rates of spontaneous viral clearance, accelerated progression of liver disease and less favourable treatment outcome, as covered in the review by Urbanus *et al.* [5,24]. The emergence of hepatitis C among HIV-positive MSM is poorly understood; it raises questions in respect to the transmission of hepatitis C which seems to be associated with rough sexual techniques and blood-blood transmission rather than sexual transmission alone [5,25], which is supported by a recent case-control study [26].

Many contributions in this special issue provide evidence that high-risk behaviour is increasing across Europe, HIV transmission is ongoing, increased levels of co-infections are observed and outbreaks of STI continue among MSM. Existing prevention campaigns do not seem sufficient to contain sexual risk behaviours among this group in Europe. Prevention campaigns need to be comprehensive and easy to understand at the same time, address primary prevention (to avoid infection), secondary prevention (to avoid the further spread of infection) and tertiary prevention (to treat the infection and reduce levels of viral load). HIV prevention campaigns promoting regular screening and condom-use should be pursued and limitations of serosorting be highlighted and explained as it exposes both HIV-negative and HIV-positive men to the risk of STI.

More research is needed to better identify the circumstances of HIV and STI transmission in order to optimise target prevention campaigns. The review by Berg shows that, despite the maturity of the HIV epidemic, outcome evaluations of any form of behavioural HIV/STI intervention for MSM in Europe are scarce [27]. Although evidence-based policies and practices are needed to tackle the increasing trends in HIV/AIDS and STI, little research is carried out to evaluate the effectiveness of interventions in MSM.

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HIV and AIDS in the European Union, 2008

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HIV infections remain to be of major public health importance in Europe, with evidence of increasing transmission in several European countries. A total of 25,656 diagnosed cases of HIV infection were reported for 2008 by the countries of the European Union and European Economic Area (EU/EEA); data were not available from Austria, Denmark or Liechtenstein. The highest rates were reported by Estonia, Latvia, Portugal and the United Kingdom. In the EU/EEA, the predominant mode of transmission for HIV infection was sex among men who have sex with men (MSM, 40%) followed by heterosexual contact (29%), when cases in persons originating from countries with generalised epidemics were excluded. Injecting drug use accounted for 6% of the reported cases. Overall, despite incomplete reporting, the number of HIV cases in 2008 has increased while the number of reported AIDS cases continued to decline except in the Baltic States. The data presented have some limitations, due to missing data from a number of countries, limiting the conclusions that can be drawn with respect to the size of the HIV and AIDS epidemics in Europe.

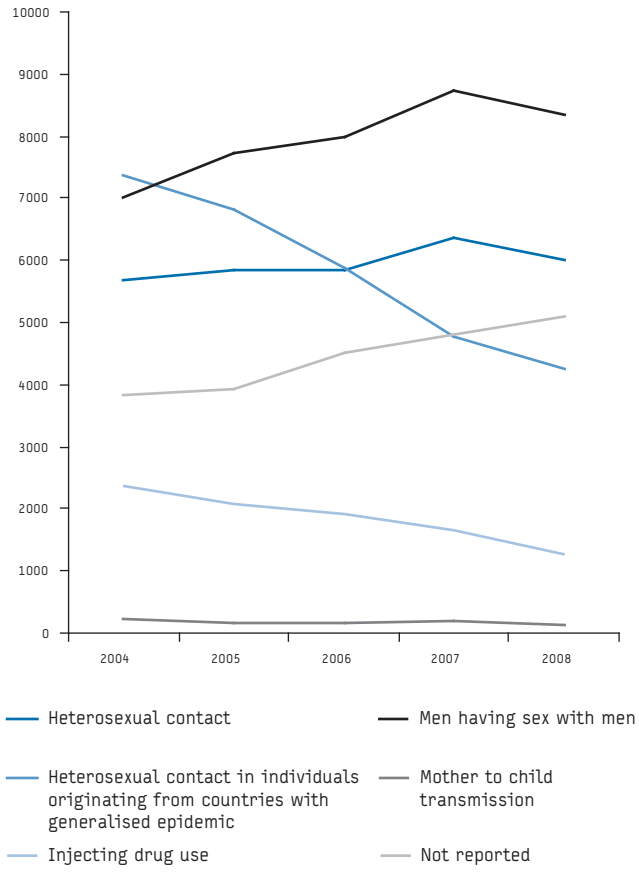
Since January 2008, the European Centre for Disease Prevention and Control (ECDC) and the World Health Organization (WHO) Regional Office for Europe have jointly carried out the HIV/AIDS surveillance in Europe. Data were collected from all countries in the WHO European region in September-October 2009. This rapid communication presents the main findings for the European Union and European Economic Area (EU/EEA) countries which will be included in a comprehensive report on the surveillance of HIV/AIDS in Europe 2008 on the occasion of World-AIDS day [1].

In total 25,656 cases of HIV infection were diagnosed and reported for 2008 by 27 of the 30 EU/EEA countries (61 cases per million population); data were missing for Austria, Denmark and Liechtenstein; data from Spain and Italy do not have a national coverage. The three countries with the highest rates of newly diagnosed HIV cases in 2008 were Estonia (406/million; 545 cases), Latvia (158/million; 358 cases) and the United Kingdom (119/million; 7,298 cases). Furthermore, rates of around 100 HIV cases per million population were reported by Portugal (106/million; 1,124 cases), Belgium (101/million; 1,079 cases), Luxembourg (97/million; 47 cases) and Italy (97/million; 1,958 cases). Among those cases for which age and sex were reported, 13 per cent were individuals between 15 and 24 years of age and 30% were women. The predominant mode of transmission is sexual contact among men who have sex with men (MSM) (40%), followed by heterosexual contact (29%), when individuals from countries with generalised epidemics (19% of all diagnosed HIV cases) are excluded. Injecting drug use accounted for 6% of diagnosed HIV cases.

Among the 23 countries that have consistently reported data since 2000, the rate of diagnosed cases of HIV per million has increased by 37% from 42 per million in 2000 (13,265 cases) to 56 per million (18,019 cases) in 2008. Rates of diagnosed cases of HIV have doubled in Bulgaria, Czech Republic, Hungary, the Netherlands, Slovakia, Slovenia; rates have increased by more than 50% in Germany, Norway, Lithuania and the United Kingdom and rates have decreased by more than 20% in Latvia, Portugal and

Figure 1

HIV infections by transmission mode and origin by year of diagnosis, European Union (EU) and European Economic Area (EEA), 2004–2008



Source: HIV/AIDS surveillance report 2008

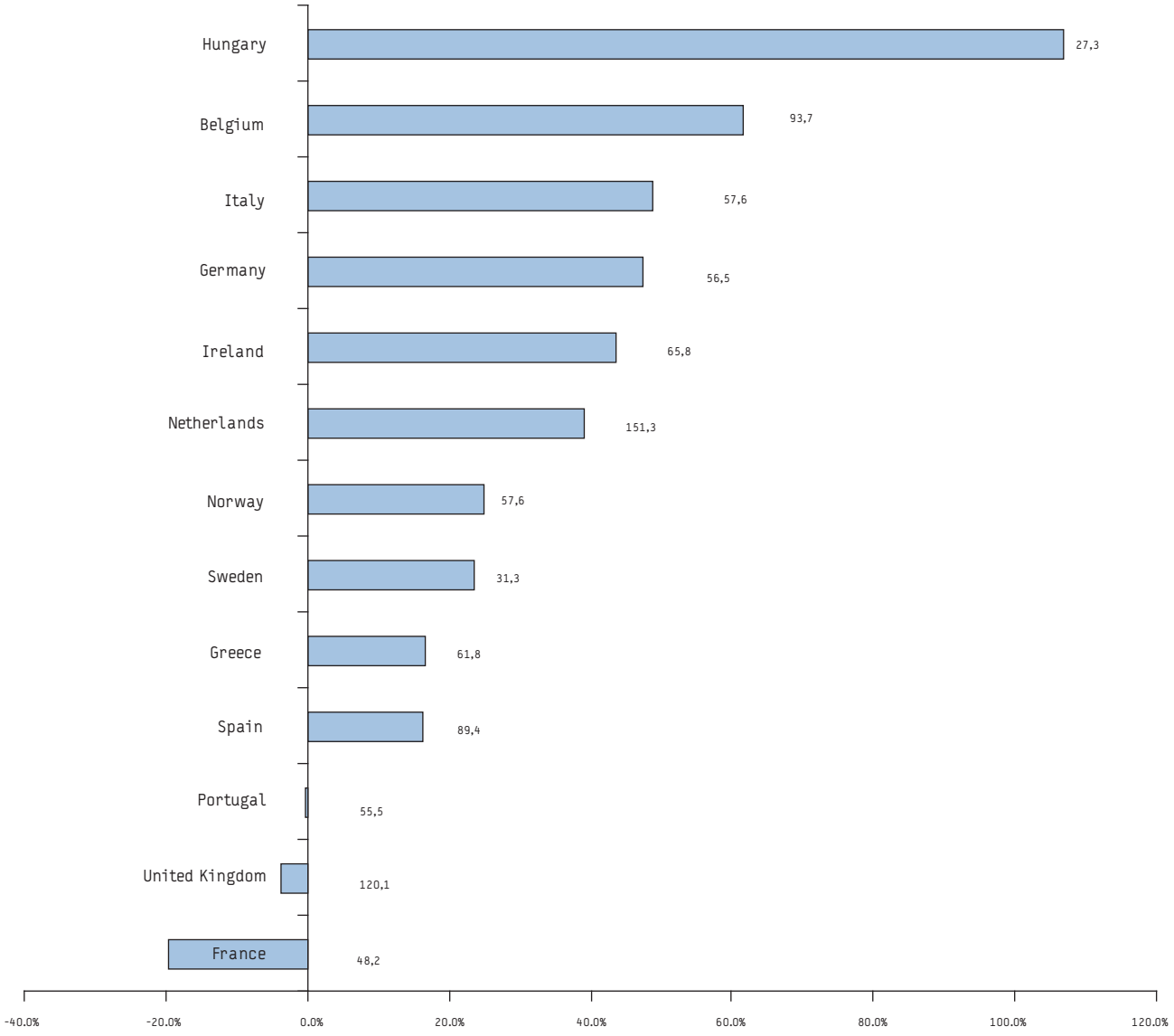
Romania. The trend data have to be interpreted with caution as reporting delays affect the actual numbers for most recent years as well as changes in reporting systems, targeting populations at risk and uptake of HIV testing may affect the numbers.

The number of HIV cases among men who have sex with men (MSM) has increased by 19% between 2004 and 2008 (Figure 1). The rate of HIV infections diagnosed in MSM as of the total male population (aged 15 – 65) ranged from 25 per million male population to 151 per million in countries that had reported at least 50 MSM diagnosed with HIV in 2008. A rate of more than 100 per million male population was found in the United Kingdom and the Netherlands. In most of the countries, diagnosed HIV cases increased between 2004 and 2008, as shown in figure 2.

The number of heterosexually acquired cases has remained fairly stable at around 6,000 cases. However, the number of cases originating from countries with generalised epidemics amongst heterosexually acquired cases decreased by 42% from 7,364 in 2004 to 4,267 in 2008. In 2008, 25 countries provided information on the origin of the cases and on the probable source of infection where the infection was acquired through heterosexual contact. In these countries, 4,267 (42%) cases were among individuals originating from countries with generalised epidemics, 113 (1%) had (or have had) a high-risk partner and 382 (4%) have had a partner from countries with generalised epidemics. The probable source of infection was unknown for 54% of cases. The proportion of heterosexually transmitted cases from countries with generalised epidemics varied from 0% in Bulgaria, Latvia, Lithuania, Poland and Slovakia to 60% in Belgium, 67% in Ireland and 69% in Norway. Around 50% of the heterosexually

Figure 2

Proportional increase in the rate of HIV infections among men who have sex with men (MSM) per million of male population between 2004 and 2008, and the rate in 2008 (for European Union and European Economic Area countries that reported at least 50 cases in MSM).



transmitted cases in Luxembourg, the Netherlands, Sweden and the United Kingdom were reported in individuals from countries with generalised epidemics.

The number of HIV reports among injecting drug users (IDU) has declined by 41% in the same period. The number of cases with unknown risk factors increased by 33% (from 3,817 to 5,083).

A total of 5,218 cases of AIDS were diagnosed in the EU/EEA countries in 2008 (no data from Denmark, Sweden or Liechtenstein), representing a rate of 11 cases per million population. The highest rates were reported by Estonia (46/million; 61 cases), Latvia (44/million; 99 cases), Portugal (36/million; 387 cases), and Spain (29/million; 1,170 cases). Since 2000, the number of reported AIDS cases diagnosed has declined by 36% in 2007 and more than 50% in 2008. The steady decrease in the number of AIDS diagnoses during this period could be due to the availability of highly active antiretroviral therapy (HAART), under-reporting and reporting delay particularly in the most recent years. During this period, the number of reported AIDS cases diagnosed has increased in ten and decreased in 17 countries. The largest increase was reported by Estonia, from three cases in 2000 (2/million) to 61 (46/million) in 2008. Other substantial increases (doubled or more) were observed in Latvia and Lithuania.

Conclusions

The highest proportion of the total number of HIV cases in EU/EFTA countries was reported among MSM. Despite the relatively low absolute number of cases diagnosed in these groups, IDU and MSM are disproportionately affected by the HIV epidemic compared with the heterosexual population because of the relatively small sizes of the populations and the high levels of HIV in these groups. National prevention programmes aimed at reducing HIV transmission within Europe should have a strong focus on MSM and take IDU into account. In addition, although, heterosexual HIV transmission remains important and is increasing in several countries, a considerable proportion of heterosexually acquired cases are diagnosed in persons originating from countries with generalised epidemics. As these populations affect the HIV and AIDS epidemics in Europe they should also be targeted in national prevention programmes and their access to treatment and care services should be ensured. Although there seems to be a decline in the number of new diagnoses among IDU, injecting drug use is still the predominant transmission mode in the Baltic States.

Enhanced surveillance of HIV and AIDS in Europe is essential to provide the information that is necessary to monitor the epidemic and evaluate the public health response to control the transmission of infections. In order to achieve this aim, countries in Europe need to ensure that surveillance data is of high quality, and to provide complete case reports with HIV and AIDS surveillance data. Achieving full coverage of reporting in all countries in Europe is of paramount importance.

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Incidence of non-B subtypes of HIV-1 in Galicia, Spain: high frequency and diversity of HIV-1 among men who have sex with men

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An increase in HIV transmission among men who have sex with men (MSM) has been reported in eight regions of Spain from 2003 to 2007. In order to study the incidence of HIV-1 genetic forms in Galicia, northwest of Spain, in particular the spread of HIV-1 variants among MSM, 93 newly diagnosed HIV-1 patients, including those with acute and recently acquired infections, were studied for a year from August 2008 to August 2009. Thirty eight (41%) were MSM. Of them, nine (24%) were infected by non-B viruses, including seven different genetic forms. The analysis of transmission clusters showed that 23 (60%) MSM grouped in different clusters and mostly in large clusters. Resistance mutations were detected in six (16%) MSM.

Introduction

Subtype B of HIV-1 is the most prevalent in Western Europe, including Spain, however, an increase in the circulation of non-B subtypes has been observed in recent years [1,2]. Another trend is the increase in HIV transmission among MSM, a phenomenon recently described in eight countries in North America, Western Europe and Australia [3].

The objective of this survey was to study the incidence of HIV-1 genetic forms in Galicia, north-western Spain, in particular the spread of HIV-1 variants among MSM.

Patients and methods

A total of 93 newly diagnosed HIV-1 patients, 72 males and 21 females who attended six hospitals of the Public Health Service of Galicia, Spain, were recruited from August 2008 to August 2009. Seventy nine (85%) were born in Spain and 14 (15%) were foreigners. Sixteen patients (17%) were at the early phase of infection, including nine with acute and seven with recently acquired infection. Transmission route was mainly by sexual contact (84%), less frequent was injecting drug use (16%).

Of the patients included in the study 38 (41%) were MSM. Of them, 32 were born in Spain. Their average age was 30.6 years (excluding a 73-year-old man), lower than the average of age of heterosexual patients (44.3 years).

RNA was extracted from plasma and amplified by RT-PCR in *pol* region, corresponding to protease and partial reverse transcriptase (PR-RT), (HXB2 positions 2107 to 3630). Sequences were assembled using Seqman software and edited with Bioedit program. For subtype assignment, phylogenetic trees were done with Mega software (http://www.megasoftware.net/) using neighbour joining method and Rega software was also used (http://dbpartners.stanford.edu/RegaSubtyping/). Resistance mutations were defined following Standford Database criteria (http://hivdb.stanford.edu/). Transmission clusters were also analysed and defined as those sequences which grouped together with a bootstrap value >=70%, following the criteria of Hillis et al. [4], where a bootstrap proportion of >=70% usually corresponds to a probability of >=95% that the corresponding clade is real. Simplot programme was used to analyse recombinants by bootscanning [5].

Results

Twenty eight (30%) patients, including 22 Spanish, were infected with non-B subtypes, with a high diversity: four pure subtypes (A, C, G, F1), four circulating recombinant forms (CRFs) (CRF01_AE, CRF02_AG, CRF12_BF, CRF24_BG) and three unique recombinant forms (URFs) (BG, BF, DB). Subtype F and BF recombinants represented 25% of non-B subtype viruses. Fifteen (54%) non-B viruses corresponded to acute and recently acquired infections (subtypes F1, G, CRF24_BG and URF BG).

Of the 38 MSM included in the study, nine (24%) were infected with non-B viruses (two F1, two CRF12_BF, one C, one CRF24_BG, one CRF01_AE, one DB and one G). Of the nine MSM with non-B subtypes, seven were Spanish, one was from Argentina (CRF12_BF) and one from Cuba (G).

The phylogenetic tree including transmission clusters is shown in Figure 1. Only bootstrap values >=70%, considered significant, are indicated in the tree. On the whole, 45 (48%) patients, including 23 of the 38 MSM (60%), could be grouped in different clusters. Their characteristics are presented in the Table. It is worth mentioning that the clusters include four patients with acute and five patients with recently acquired infection.

We identified a total of 17 clusters: one formed by nine patients, four including three individuals and 12 two-person clusters. Although in our study a bootstrap proportion of >=70% was considered significant [4], it is to be underlined that all but two clusters were grouped with a bootstrap value close to 100%. The samples X2558 and X2578, corresponding to IDU patients and included in the only cluster with a bootstrap value of 70%, were analysed more in-depth by bootscanning (Figure 2A and B). One of these samples (X2578) was defined as subtype B strain and the other (X-2558) resulted a BG recombinant with a recombination point at position 2700 (HXB2). In the second plot (Figure 2B) it is shown that subtype B sequence of this BG recombinant grouped with the B sequence of X-2578. The fact that both samples only shared a fragment of PR/RT sequence could be the cause of the bootstrap value of 70%.

Of the 23 MSM who were grouped in transmission clusters, it is worth mentioning that seven were included in the large cluster, six in two clusters of three patients and six in two-person clusters, all of them infected with subtype B. The remaining four MSM were grouped with non-MSM patients, as follows: one in a cluster of three individuals infected with subtype F, and three in two-person clusters infected with subtype B, G and CRF12_BF, respectively. Most of the MSM who were grouped in transmission clusters attended the same hospital (Xeral-Cies, Vigo, Pontevedra)

Resistance mutations were detected in 17 (18%) samples: two against nucleoside RT inhibitors (RTIs), nine against non nucleoside RTI (NNRTIs), four against both classes of RTIs, one against PR inhibitors (PRIs), and one against both PRI and NNRTIs. Of the 17 resistance samples, six corresponded to MSM, four subtype B, one DB recombinant and one CRF12_BF. Resistance mutations against NNRTIs were detected in three patients, two against NRTIs and NNRTIs and one against NNRTIs and PRIs.

The majority of resistance strains (nine out of 17) were part of the transmission clusters. The most frequent mutation was K103N, detected in six patients, three of them were MSM included in one transmission cluster.

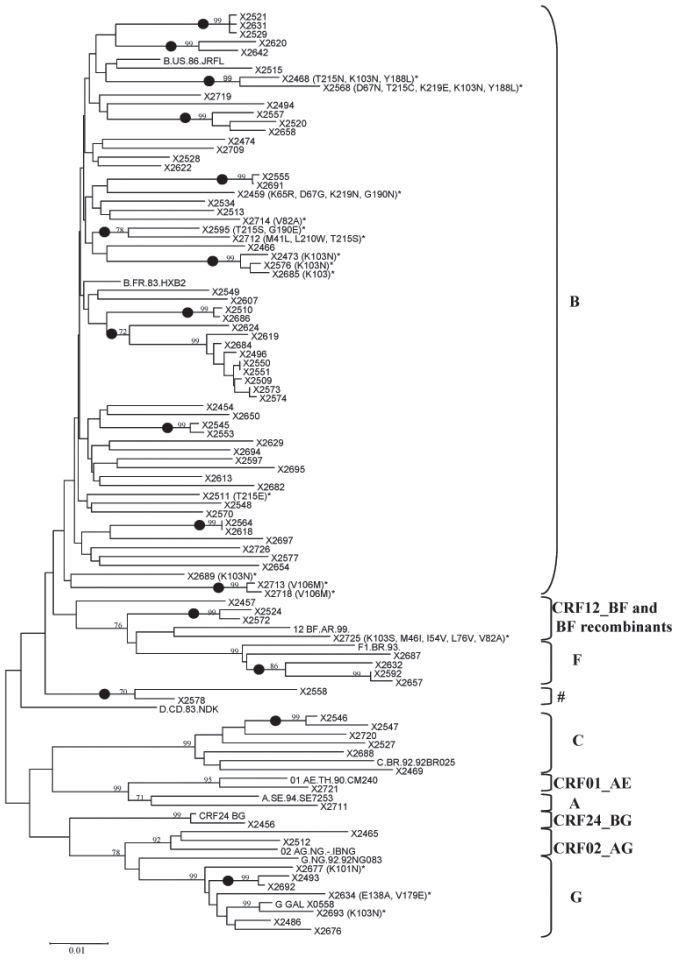
Discussion

Of the newly diagnosed HIV-1 patients included in our study, 41% were MSM, which adds evidence to the observation of increasing transmission among this risk group. This is in line with earlier findings indicating an increase in the percentage of MSM among newly diagnosed HIV cases in Galicia from 31% in 2006 to 33% in 2007 (data not published). In another study with 261 newly diagnosed patients from the Basque Country, Spain, we noted an increase in the proportion of MSM from 15.7% in 2004 to 51.2% in 2007 [2]. These results are in agreement with studies from other industrialised countries [3,6], underlining that efforts are required to target HIV prevention measures specifically at MSM.

A high prevalence (30%) of HIV-1 non-B subtypes and a high HIV-1 diversity have been detected in our study, indicating an

FIGURE 1

Phylogenetic analysis of newly diagnosed HIV cases, Galicia, Spain, 2008-2009



Neighbour-joining algorithm implemented in Molecular Evolutionary Genetic Analysis (MEGA) version 3.1 was used to build the phylogenetic tree of newly diagnosed patients from Galicia. One hundred bootstrap replicates were used to assess the reliability of tree topologies. Bootstrap values of 70% or higher, considered as significant, were included in the tree. Clusters are indicated with dots. Reference of the specific subtype G strain which is circulating in Galicia is included with the name G GAL XO558. Resistance mutations are also included in brackets and highlighted with an asterisk. The # symbol was used to mark a cluster formed by a BG sample and a B sample as is shown in Figure 2. The sequence X2556 has been excluded because it showed mixtures.

TABLE

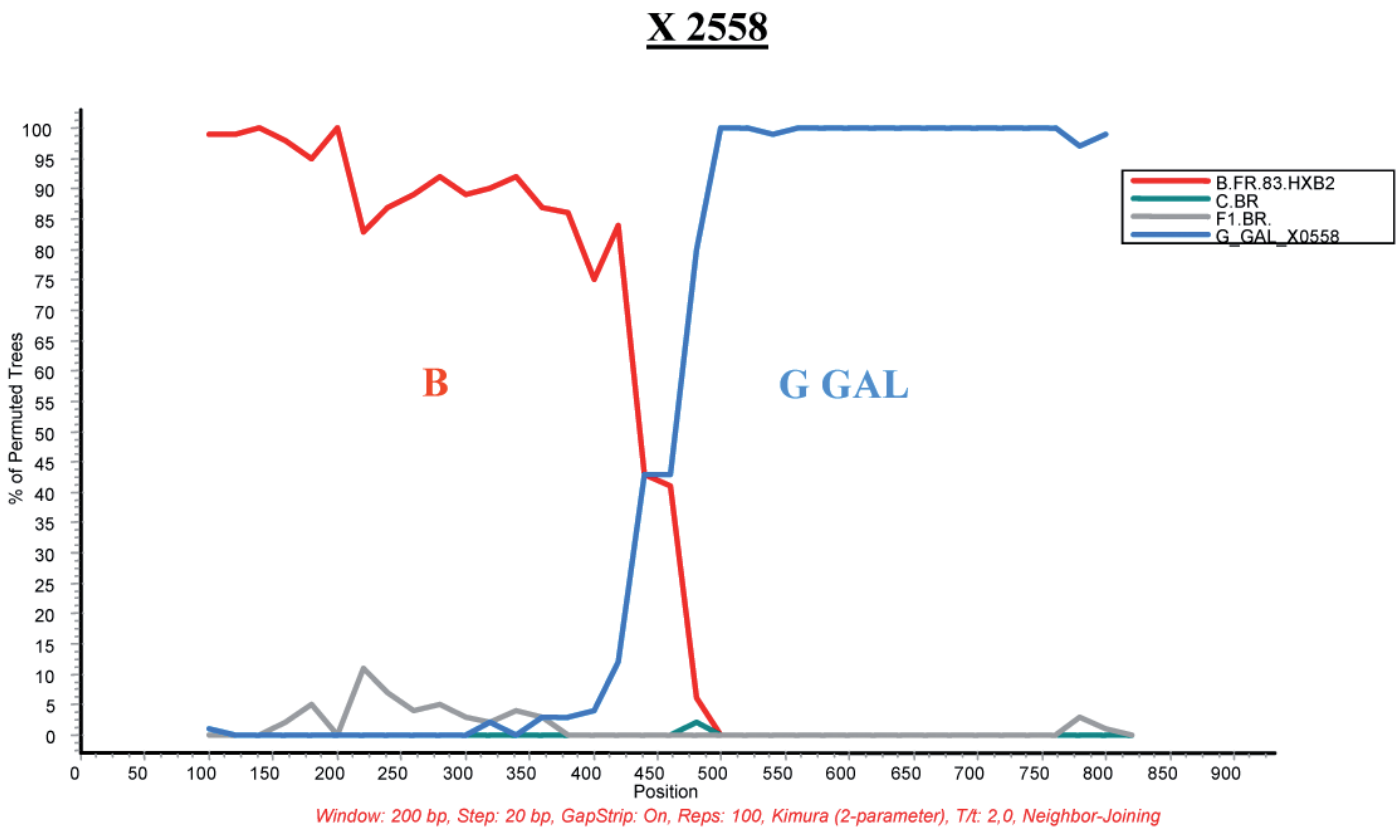
Characteristics of HIV patients grouped in transmission clusters based on phylogenetic analysis, Galicia, Spain, 2008-2009

HIV genetic form	Number of clusters	Number of patients	Gender		Transmission mode		
			M	F	MSM	HT	IDU
B	13*	36	29	7	20	9	7
G	1	2	2		1	1	
F1	1	3	1	2	1	2	
C	1	2	1	1		2	
CRF12_BF	1	2	1	1	1	1	
TOTAL	17	45	34	11	23	15	7

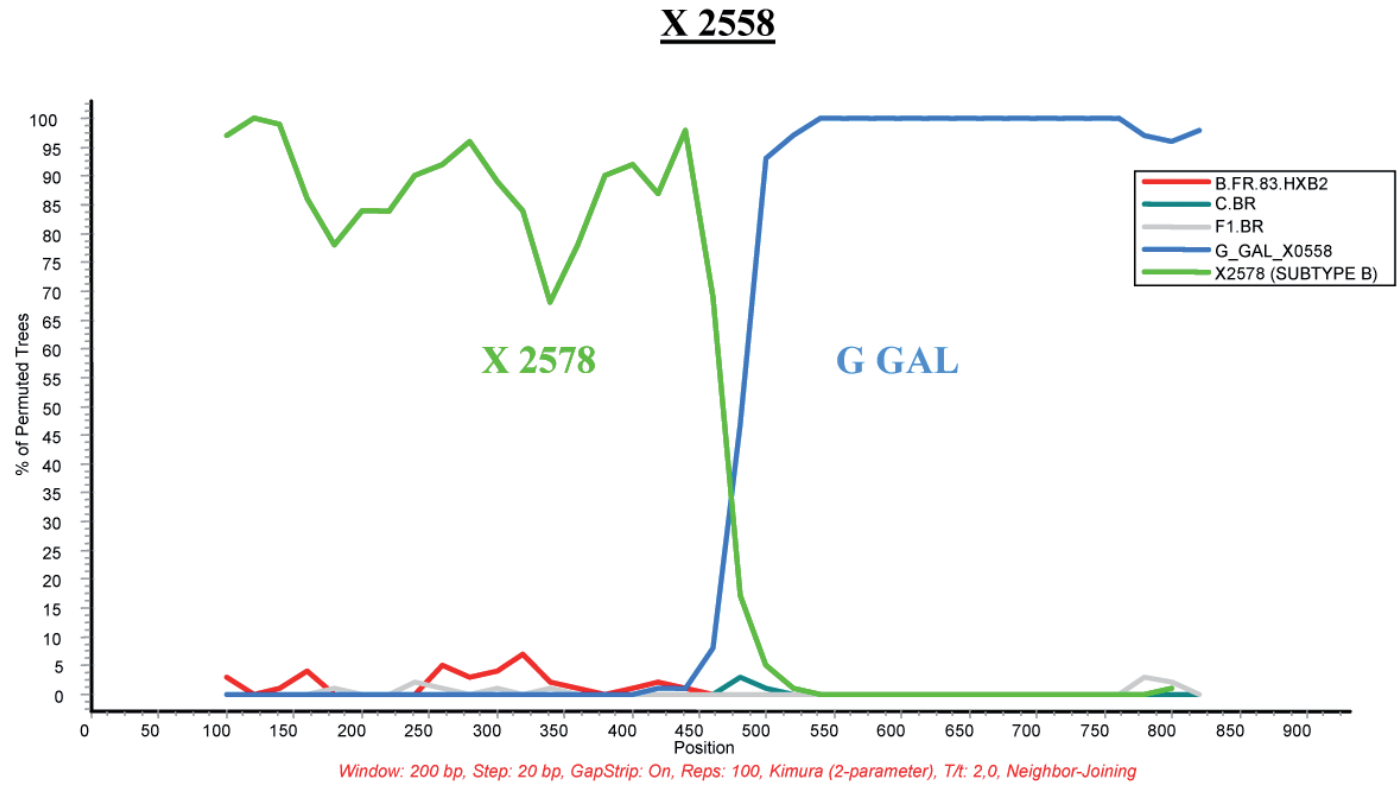
M: male, F: female, MSM: men who have sex with men, HT: heterosexual contact; IDU: injecting drug use.
* One of these clusters is composed by a B strain and a BG recombinant.

FIGURE 2

Bootscan analysis of pol sequence of sample X2558



A) The horizontal axis represents the nucleotide position of the midpoint of the window from the 5´end of protease, and the vertical axis represents the bootstrap value supporting clustering with the corresponding subtype. A window size of 200 nt and a step size of 20 nt was used. Reliability of tree topologies was assessed with 100 bootstrap replicates for each window. Neighbour-joining trees were constructed using Kimura´s two-parameter distances. The plot shows a recombination between subtype B and G. The reference subtype G used (G_GAL_X0558) is subtype G circulating in Galicia and Portugal.



B) The horizontal axis represents the nucleotide position of the midpoint of the window from the 5´end of protease, and the vertical axis represents the bootstrap value supporting clustering with the corresponding subtype. A window size of 200 nt and a step size of 20 nt was used. Reliability of tree topologies was assessed with 100 bootstrap replicates for each window. Neighbour-joining trees were constructed using Kimura´s two-parameter distances The sequence X2578, corresponding to the sequence clustering with X2558 in the initial analysis, was also used as subtype B reference, showing that the B sequence of X-2558 clustered with X2578 instead of B reference.

increase in comparison with the results of previous studies in this area [7,8]. Most (79%) of the non-B subtype strains were found in the native Spanish population. It is worth mentioning that non-B subtypes were also detected in patients with acute or recently acquired infection, indicating that these might be the most commonly viruses circulating in Galicia at the time of this survey.

The proportion of non-B subtypes among MSM (24%) was similar between Spanish and non-Spanish patients and higher than that described in an Italian survey [9], although in this study a higher frequency among non-Italian patients was detected. In our study, nine different genetics forms were detected, including subtypes, CRFs and URFs. It is worth mentioning the presence of subtype G among MSM, because this subtype was initially transmitted among intravenous drug users [8].

A high proportion of patients, close to half, were phylogenetically clustered. This result is in agreement with the results of Lee et al. [10] whose study focussed on acute and recent drug-naïve seroconverters. It is worth mentioning that 23 out 38 (61%) MSM were grouped in transmission clusters and most frequently in large clusters, whereas clusters detected in heterosexual patients were mostly two-person clusters. Although in our study a bootstrap proportion of >=70% was considered significant [2,4,11], it is notable that all but two clusters were grouped with a bootstrap value close to 100%, data that are in agreement with other authors [12], suggesting a common origin of the infection.

One of the most important problems related to newly diagnosed patients is the presence of transmitted resistance mutations which can persist throughout the years, limiting the future treatments [13]. This problem becomes aggravated when newly diagnosed patients and treated patients harbouring resistance mutations [2,14] take part in the same transmission clusters [2,14], facilitating the spread of these resistance strains. In our study most of the resistance strains (nine out of 17) were part of transmission clusters, and three out of six patients with K103N resistance mutation constituted one cluster of three MSM.

In conclusion, our results showed an increase in HIV-1 transmission among MSM, showing a high variability of genetic forms. A high proportion of MSM were grouped in transmission clusters, suggesting an increase in sexual risk behaviour in this group.

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Addendum:

The sequences reported in this article have been sent to GenBank, the accession numbers are: GU326099-GU326190. [added on 7 January 2010.]

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HIV and STI behavioural surveillance among men who have sex with men in Europe

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This paper describes behavioural surveillance for HIV and sexually transmitted infections (STI) among men who have sex with men (MSM) in Europe, focusing on the methods and indicators used. In August 2008, questionnaires were sent to European Union Member States and European Free Trade Association countries seeking information on behavioural surveillance activities among eight population groups including MSM. Thirty-one countries were invited to take part in the survey and 27 returned a questionnaire on MSM. Of these 27 countries, 14 reported that there was a system of behavioural surveillance among MSM in their country while another four countries had conducted behavioural surveys of some kind in this subpopulation. In the absence of a sampling frame, all European countries used convenience samples for behavioural surveillance among MSM. Most European countries used the Internet for recruiting and surveying MSM for behavioural surveillance reflecting increasing use of the Internet by MSM for meeting sexual partners. While there was a general consensus about the main behavioural indicators (unprotected anal intercourse, condom use, number of partners, HIV testing), there was considerable diversity between countries in the specific indicators used. We suggest that European countries reach an agreement on a core set of indicators. In addition we recommend that the process of harmonising HIV and STI behavioural surveillance among MSM in Europe continues.

Introduction

In many European countries men who have sex with men (MSM) are at increased risk for HIV and other sexually transmitted infections (STI) such as syphilis or gonorrhoea. Even though there has been an increase in the number of new HIV diagnoses among heterosexual men and women in some European countries in recent years, MSM still remain at greatest risk of acquiring HIV in Europe [1]. As a consequence, a number of European countries have conducted behavioural surveys among MSM to monitor HIV and STI risk in this population [2]. In some countries these surveys are part of a well established behavioural surveillance programme while in others they are conducted on an ad hoc basis.

Behavioural surveillance allows us to monitor, at a population level, risks related to HIV and STI transmission. Trends in risk behaviour can provide a valuable insight into corresponding trends in disease incidence over time. In addition, behavioural surveillance provides information for planning and evaluating prevention interventions.

In 2008, a study was conducted to map HIV and STI behavioural surveillance activities in European Union (EU) Member States and European Free Trade Association (EFTA) countries, focusing on the methods and indicators used for behavioural surveillance. Information was collected on behavioural surveillance in eight different populations, specifically the general population, young people, MSM, injecting drug users (IDU), people living with HIV or AIDS (PLWHA), sex workers, people attending STI clinics, migrants and ethnic minorities. In this paper we describe the key findings from the mapping exercise concerning behavioural surveillance among MSM in Europe.

Methods

In 2008, questionnaires were sent to all EU Member States and EFTA countries concerning behavioural surveillance activities in each country (see Table 1 for list of countries). Each country received nine separate questionnaires. One questionnaire concerned national behavioural surveillance and second generation surveillance systems. The remaining eight questionnaires addressed each of the specific subpopulations. It was emphasised on each questionnaire that the focus was behavioural, as opposed to biological surveillance. Behavioural surveillance was defined as "the collection and use of data from different sources and/or different time points to globally ascertain the state and evolution of the HIV/AIDS and/or STI epidemics at the behavioural, as opposed to biological, level".

In the population-specific questionnaires we asked whether a behavioural surveillance system was currently in place for that population. If so, each country was asked to provide information about their methodology for conducting behavioural surveillance in that population. In particular, they were asked to provide information on the year(s) when they had conducted behavioural surveys since 1985 in that group, the sampling method, data collection and the main topics covered. The main topics were grouped under the following headings: knowledge and attitudes, sexual relationships and sexual partners, sexual activity and lifestyle, exposure to risk of infection, HIV and STI, drugs and substance use. Information was

also requested on the main indicators currently used for behavioural surveillance.

The questionnaires were sent by email to the person responsible for national HIV surveillance in that country with the option of consulting other colleagues with specialist knowledge to help them complete the questionnaires. The key contact in each country then returned the completed questionnaires, and these were loaded into a password-protected database. The data for each population were analysed separately by an expert member of the project team (see list at the end of the article).

Results

Behavioural surveillance

Thirty-one countries were invited to take part in the survey and 27 returned a questionnaire on MSM. Of these 27 countries, 14 reported that there was a system of behavioural surveillance among the MSM population in their country: Belgium, Denmark, Estonia, France, Germany, Ireland, Lithuania, the Netherlands, Norway, Slovenia, Spain, Sweden, Switzerland and the United Kingdom (Table 1).

An additional four countries did not consider that they had such a system but nonetheless had conducted behavioural surveys among

Table 1

HIV and STI behavioural surveillance among men who have sex with men (MSM) in 31 European countries

Country	BS* among MSM	Year of survey			Frequency of surveys (years)	Sampling and recruitment			Data collection		Coverage	Sample size each year
		First survey	Last survey**	Next survey		Internet	Gay venues	Gay press	Internet	Pen & paper		
Austria	N	-	-	-	-	-	-	-	-	-	-	-
Belgium	Y	1992	2005	?	Irregular	Y	Y	Y	Y	Y	Regional	500-1100
Bulgaria+	-	-	-	-	-	-	-	-	-	-	-	-
Cyprus	N	-	-	-	-	-	-	-	-	-	-	-
Czech Republic	N	-	-	-	-	-	-	-	-	-	-	-
Denmark	Y	2000	2006	2009	1-4	Y	Y	-	Y	Y	National	2000
Estonia	Y	2004	2007	?	3	Y	Y	-	Y	Y	National	300
Finland***	N	2006	2006	?	NA	-	-	Y	-	Y	National	400
France	Y	1985	2007	2009	2-3	Y	Y	Y	Y	Y	National	3000-15000
Germany	Y	1987	2007	?	2-3	Y	Y	Y	Y	Y	National	200-6000
Greece***	N	2007	2007	?	NA	Y	-	-	Y	-	National	200
Hungary	N	-	-	-	-	-	-	-	-	-	-	-
Iceland	N	-	-	-	-	-	-	-	-	-	-	-
Ireland	Y	2000	2008	2009	Annually	Y	Y	-	Y	Y	National	900-1300
Italy+	-	-	-	-	-	-	-	-	-	-	-	-
Latvia***	N	2001	2001	?	NA	-	Y	-	-	Y	National	100
Lichtenstein	N	-	-	-	-	-	-	-	-	-	-	-
Lithuania	Y	2003	2007	?	1-3	Y	Y	-	Y	Y	Regional	100-200
Luxembourg	N	-	-	-	-	-	-	-	-	-	-	-
Malta	N	-	-	-	-	-	-	-	-	-	-	-
Netherlands	Y	2000	2008	2009	1-3	Y	Y	-	Y	Y	National	800-4500
Norway	Y	2007	2007	2009	2	Y	-	-	Y	-	National	2300
Poland***	N	2004	2004	?	NA	-	Y	-	-	Y	National	?
Portugal+	-	-	-	-	-	-	-	-	-	-	-	-
Romania+	-	-	-	-	-	-	-	-	-	-	-	-
Slovakia	N	-	-	-	-	-	-	-	-	-	-	-
Slovenia	Y	2000	2007	2009	Annually	-	Y	-	-	Y	Regional	100
Spain	Y	1995	2004	?	2-3	Y	Y	-	Y	Y	National	95-900
Sweden	Y	2006	2008	2012	2-4	Y	-	-	Y	-	National	3000
Switzerland	Y	1987	2008	2009	2-3	Y	Y	Y	Y	Y	National	500-1244
UK	Y	1993	2008	2010	1-3	Y	Y	-	Y	Y	National	800-15000

*BS: Behavioural surveillance
** As of September 2008
*** Four countries stated they did not have a system of behavioural surveillance among MSM but nonetheless had conducted behavioural surveys in this subpopulation
+ Four countries did not return a questionnaire concerning MSM (Bulgaria, Italy, Portugal, Romania)

MSM (Finland, Greece, Latvia and Poland). Latvia has conducted repeat surveys among MSM while Finland, Greece and Poland have only conducted one survey to date.

For simplicity these 18 countries are all described as conducting behavioural surveillance since 15 countries have done repeat surveys, while Finland, Greece and Poland have done only one but may do another one in the future.

The remaining nine countries reported that there was no system of behavioural surveillance among MSM in their country, nor had they conducted behavioural surveys among this population: Austria, Cyprus, Czech Republic, Hungary, Iceland, Liechtenstein, Luxembourg, Malta and Slovakia. No information was available for Bulgaria, Italy, Portugal and Romania since they did not return a questionnaire for MSM (Table 1).

In general, Western European countries established behavioural surveillance among MSM before Central or Eastern European countries. France was the first country to introduce behavioural surveillance among MSM in 1985, followed by Switzerland and Germany (1987), Belgium (1992), United Kingdom (1993) and Spain (1995). Other Western European countries started later: Denmark, Ireland and the Netherlands in 2000, followed by Finland, Sweden (2006), Norway and Greece (2007). Behavioural surveillance among MSM in Central and Eastern Europe was established from the mid 1990s. The first Central/Eastern European country to conduct a behavioural survey among MSM was Latvia (1997), followed by Slovenia (2000), Lithuania (2003), Poland and Estonia (2004) (Table 1).

Sampling and recruitment

All countries used convenience samples for behavioural surveillance among MSM. Fourteen of the 18 countries recruited MSM from community venues such as gay bars, clubs and saunas, or had done so in the past (Table 1). In the United Kingdom, men were also recruited through gyms. Five countries used the gay press for recruitment (Belgium, Finland, France, Germany and Switzerland).

Fourteen of the 18 countries recruited men through the Internet, reflecting increased use of the Internet by MSM for meeting sexual

Table 2

Topics most frequently covered in behavioural surveillance among men who have sex with men (MSM) in European countries

	Number of countries where this topic is covered*
Knowledge and attitudes	
Knowledge about HIV/AIDS infection and/or treatments	14
Knowledge of post-exposure prophylaxis (PEP)	10
Awareness of prevention activities	14
Sexual relationships and sexual partners	
Types of partners/relationships, such as regular partner, casual partners	15
Sexual activity and lifestyle	
Sexual activity, such as number of partners, frequency of sexual contacts	16
Sexual orientation	16
Sexual practices	15
How and where partners are met	12
Exposure to risk of infection	
Condom use at last intercourse	14
Condom use with different types of partners	16
Condom use in different types of sexual practice (e.g. vaginal, anal, oral sex)	12
Risk reduction strategies (such as negotiated safety, serosorting, positioning)	11
HIV and other STI	
HIV testing	15
Current or past STI other than HIV and hepatitis	14
Result of last HIV test (self-reported)	15
Result of last HIV test (measured)	7
Drugs and substance use	
Types of drugs consumed	12
Use of psycho-active substances (including alcohol) and intercourse	10
Injecting drug use	7
Socio-demographic characteristics	
Education	15
Employment	12
Nationality and/or ethnic origin	10

*Information on topics covered was provided by 16 countries.

partners [3] (Table 1). Only Finland, Latvia, Poland and Slovenia have not yet recruited MSM through the Internet. The first country to use the Internet for recruiting MSM was Belgium in 1998.

Respondent driven sampling (RDS) has been used in two countries only (Estonia and Greece). In Estonia this approach was reportedly not successful. Only 60 men were recruited using this method.

In most countries (n=15), national samples were recruited although "local" samples were often included too. In the other three countries (Belgium, Lithuania, Slovenia) only local samples were recruited. The local samples were often recruited in cities with large MSM populations such as London, Paris, Geneva or Ljubljana.

TABLE 3

Specific indicators currently used for behavioural surveillance among men who have sex with men (MSM) in European countries

Indicator
Unprotected anal intercourse (UAI)*
UAI with any partner
UAI with a casual partner
UAI with a main partner
UAI with a partner of unknown or opposite status
UAI with a partner of unknown status
UAI with a casual partner of unknown or discordant HIV status
UAI with a main partner of unknown or discordant status
Number of UAI partners
Frequency of UAI
UAI at last sexual encounter
UAI at last sexual encounter with a man of unknown HIV status
Condom use
Used condom during last anal intercourse (AI)
Used condom during most recent AI with casual partner
Used condom during last AI with partner of unknown or discordant HIV status
Always used condom in last 12 months
Always used condom with casual partner in last 12 months
Always used condoms with main partner in last 12 months
Number of partners*
Number of anal sex partners
Number of steady and casual partners
Number of partners for anal or oral sex
Number of men reporting more than 10 partners
HIV testing
Ever tested for HIV
Tested for HIV in the last 12 months
Tested for HIV in the last 12 months and knows the results
Percentage with undiagnosed HIV
Percentage who tested HIV-positive
Percentage of HIV-positive MSM who are on treatment
Percentage of HIV-positive men with a detectable viral load

* For UAI and the number of sexual partners, most countries used a 12-month time period but some used a three- or six-month period

Local samples can act as sentinel populations for monitoring time trends in sexual behaviour in metropolitan areas.

Sample size varied between countries. This is not surprising, since the size of the general population, and therefore the MSM population, also varies between countries. But an additional factor was the sampling method. Samples recruited through the Internet were generally larger than those recruited in the community (e.g. in bars, clubs and other venues). For community samples, sample size ranged from 100 (Slovenia, Latvia, Lithuania) to 2,000 (London), while for Internet samples it ranged from 900 (Ireland, Spain) to 15,000 (France).

Data collection

Surveys conducted in community venues (e.g. bars, clubs, gyms, saunas) or through the gay press used pen-and paper questionnaires for data collection (n=15 countries), but increasing use of the Internet for recruitment has led to the use of web surveys completed online. In the last five years, 14 countries have conducted behavioural surveillance among MSM using web surveys (Table 1). Of these 14 countries, three (Greece, Norway, Sweden) used exclusively online surveys for data collection while 11 also used pen-and-paper questionnaires for their community samples. Greece, Norway and Sweden all introduced behavioural surveillance after 2000.

Thirteen countries reported collecting behavioural surveillance data regularly, while five did not (Belgium, Finland, Greece, Latvia, Poland). In those five countries, the cross-sectional surveys were conducted on an ad hoc basis.

In the thirteen countries that conducted surveys regularly, the interval between surveys varied widely. Some countries (e.g. United Kingdom) conducted cross-sectional surveys annually among MSM while others conducted their surveys every 3-5 years.

Nine countries reported they would repeat the survey between 2009 and 2012. In the remaining nine countries, a decision has yet to be made about future surveys.

Topics currently covered

Sixteen of the 18 countries provided information on the range of topics covered in their behavioural surveys. The topics most commonly covered among MSM are presented in Table 2. Most of these topics were surveyed regularly as part of a country's behavioural surveillance programme. The exceptions were 'Risk reduction strategies' and 'How and where men met their sexual partners'. About half the countries covered these regularly, while the other half did so irregularly.

Current behavioural surveillance indicators

Ten of the 18 countries provided information on their current behavioural surveillance indicators, (Belgium, Denmark, France, Lithuania, the Netherlands, Slovenia, Spain, Sweden, Switzerland, the United Kingdom).

Four main indicators are in current use in most of these countries. These are:

- Unprotected anal intercourse
- Condom use
- Number of partners
- HIV testing

However, there was considerable diversity between countries in the specific indicators as can be seen in Table 3.

Discussion

This study, mapping HIV and STI behavioural surveillance in Europe, identified 14 countries with a system of behavioural surveillance among MSM and another four that had conducted behavioural surveys in this population. Nine countries did not have a system of behavioural surveillance among MSM and a further four countries did not provide any information.

The study revealed considerable diversity between countries in when behavioural surveillance began, the range of indicators used and how frequently surveys are repeated. For example, Western European countries generally introduced behavioural surveillance among MSM before Central or Eastern Europe, but this was not always the case. On the other hand, since there is no sampling frame for MSM, all European countries have used "convenience samples" for behavioural surveillance in this population, often recruited through the Internet.

Indicators

Although a wide range of behavioural surveillance indicators is currently used, these can be grouped under four main headings: unprotected anal intercourse, condom use, number of partners and HIV testing. A consensus appears to have emerged across Europe as to which are the most important indicators for behavioural surveillance among MSM [4,5]. However, there is also enormous variation between countries in the specific indicators used which makes direct comparison between countries problematic.

One way forward would be for all countries to incorporate a core set of indicators for behavioural surveillance among MSM. The suggested set of indicators is summarised below.

Suggested set of indicators for behavioural surveillance among MSM

- Unprotected anal intercourse (UAI) with a partner of unknown or discordant HIV status in the last 12 months (overall and separately for casual and main partners)
- Unprotected anal intercourse (UAI) with a casual partner of the same HIV status in the last 12 months
- Diagnosed with an STI in the last 12 months
- Tested for HIV in last 12 months
- Percentage who are HIV-positive
- Number of sexual partners in last 6 or 12 months (male and female)
- Used condom at last anal intercourse (distinguishing between casual and main partners)
- Where men met their sexual partners in the last 12 months (saunas, bars, clubs, Internet, etc.)

The suggested UAI indicators need to differentiate: (i) between main and casual partners and (ii) between a partner of unknown or discordant HIV status and a partner of the same HIV status ("serosorting").

Main and casual partners

It is important to differentiate between main and casual UAI partners of unknown or discordant HIV status. This differentiation is important since, in some European countries, HIV transmission among MSM is more likely to occur within a regular relationship [6] while in other countries it is more likely to occur with a casual partner [7]. Collecting data on UAI with main as well as casual partners of unknown or discordant HIV status, will allow us to identify the context in which HIV transmission occurs among MSM in Europe.

Partners of the same HIV status

An increasing number of HIV-positive men report 'serosorting' with casual partners, i.e. only having UAI with casual partners who are also HIV-positive [8,9]. In principle, this does not present a risk of HIV transmission to someone who is uninfected, but it does present a risk for STI transmission among HIV-positive MSM [10,11]. Serosorting has undoubtedly contributed to the recent increase in STI among HIV-positive MSM in Western Europe and therefore needs to be monitored [12]. In addition, some HIV-negative men report serosorting with casual partners as a risk reduction strategy [13,14]. Since it is extremely difficult for HIV-negative men to establish seroconcordance reliably in a casual encounter, serosorting with casual partners among HIV-negative men presents a risk for HIV transmission.

The suggested set of indicators could provide a template for behavioural surveillance in European countries. The suggested indicators incorporate those recommended by the United Nations General Assembly Special Session (UNGASS) but in some respects they are more precise. For example, our suggested set of indicators differentiates between main and casual partners.

The Joint United Nations Programme on HIV/AIDS (UNAIDS) and the World Health Organization (WHO) recommend that behavioural surveillance and biological surveillance be combined as part of a second generation surveillance system. In this way, behavioural and biological data can be used to validate one another. "Two sets of data pointing in the same direction make a more convincing case than just behavioural data or HIV prevalence alone" [2].

Sampling

One of the challenges for conducting behavioural surveillance among MSM is that there is no sampling frame from which to draw a probability sample [15]. To date, it has been impossible to assess the size of the MSM population in any one country since questions on sexual identity or sexual behaviour are not routinely included in national censuses. Questions on sexual behaviour or identity may be included in some national probability surveys, but these studies usually recruit relatively small numbers of MSM [16]. As a consequence, behavioural surveillance among MSM in all European countries relies on 'convenience samples'.

In Europe 18 countries have conducted cross-sectional surveys in convenience samples of MSM recruited through a number of channels including the gay press, bars and gyms. An increasing number of countries now recruit men through the Internet. In the last five years, fourteen of the eighteen countries conducting behavioural surveillance or surveys among MSM have used the Internet for recruitment and data collection. This reflects the well established trend for MSM to meet sexual partners through the Internet via dating sites [17-19]. Three of the four countries that have not yet used the Internet for behavioural surveillance were in Central or Eastern Europe (Latvia, Poland, Slovenia).

An advantage of using convenience samples is that it is possible to recruit large numbers of MSM who may be at risk for HIV and STI, at relatively low cost. This is especially true for Internet samples. On the other hand, the disadvantage is that convenience samples are not representative of the overall MSM population [15].

While it is possible to recruit quasi-probability samples of MSM using time-location sampling in venues [20,21], this can be costly when compared with recruiting men through the Internet. Since behavioural surveillance requires cross-sectional surveys to be repeated at regular intervals, keeping the cost down is a priority for many countries. In general, convenience samples, including those recruited through the Internet, tend to overestimate the true level of HIV or STI risk in the MSM population [22,23]. However, if sampling bias remains constant from one cross-sectional survey to the next, then for surveillance purposes it is possible to monitor time trends in risk behaviour using convenience samples with some degree of reliability.

Two countries used respondent driven sampling (RDS) to recruit MSM for behavioural surveillance. In Estonia only 60 men were recruited using RDS; they had hoped to recruit 400 men using this method. It seems that RDS reached a less diverse group of MSM in Estonia than recruitment through the Internet. There was a number of reasons why RDS did not work in Estonia [24]. Because employment rates are high in Estonia, there was relatively little interest in the financial reward for taking part in the RDS survey. Also, the opportunity to have a free HIV/STI test was not hugely attractive in a country where testing is widely available. In addition, married men or men with girlfriends were afraid of taking part in an RDS survey for MSM, whereas they were more willing to take part in an Internet survey. The Estonian experience highlights the importance of examining context when using RDS for recruiting MSM for behavioural surveillance [24].

Gaps, opportunities and limitations

Several important gaps have emerged from this mapping exercise. The most striking is that nine European countries have not introduced behavioural surveillance among MSM (and another four did not provide any information) even though MSM remain the group most at risk of acquiring HIV in many European countries [1]. Some of these countries have too small a population to justify conducting behavioural surveillance among MSM. It is important to recognise that in some European countries MSM may be harder to reach than in others because of cultural or religious barriers.

Behavioural surveillance among gay men provides an opportunity to collect detailed information about the behaviour of HIV-positive gay men (as well as those who are HIV negative or untested). Very few European countries have established a programme of behavioural surveillance among people living with HIV. Consequently, behavioural surveys in population groups where the prevalence of HIV is relatively high (e.g. gay men) allows trends in behaviour to be monitored specifically among gay men living with HIV.

Although the majority of European countries now recruit gay men online for behavioural surveillance (i.e. via the Internet), little is known about the websites used in those countries. Do different websites attract different kinds of men? If so, selection bias could vary from one country to another which could affect comparisons of behavioural data between countries.

A limitation of this analysis is that it depends on the accuracy and completeness of the data provided by Member States concerning behavioural surveillance in each country. Nonetheless, as can be seen in the full report (see table 8.3 p. 90-6) those countries that returned a questionnaire provided comprehensive and detailed information. An additional point is that four countries did not return the MSM questionnaire although a review of the literature suggests that behavioural research has been conducted in some of those countries [4].

Conclusion

In conclusion, this study mapping behavioural surveillance among MSM in Europe has revealed both similarities and differences between countries. In a number of European countries behavioural surveillance among MSM has developed along similar lines without formal coordination. On the other hand, the diversity of behavioural indicators limits the extent to which direct comparisons can be made between countries. As part of its mandate to coordinate surveillance of communicable disease in the EU, the European Centre for Disease Prevention and Control (ECDC) will support and encourage harmonisation of behavioural surveillance among MSM in EU Member States.

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The HIV and STI Behavioural Surveillance Mapping Group:

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- Helen Ward, Imperial College, London, United Kingdom (sex workers);
- Nicola Low, Institute for Social and Preventive Medicine, Bern, Switzerland (STI clinic patients);
- Mary Haour-Knipe, freelance consultant (formerly IOM) (migrants and ethnic minorities);
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- Bertrand Graz, IUMSP, Lausanne, Switzerland (literature review);
- Marita van de Laar, ECDC, Stockholm, Sweden (coordinator).

The full report is available at:

http://www.ecdc.europa.eu/en/publications/Publications/0909_TER_Mapping_of_HIV_STI_Behavioural_Surveillance_in_Europe.pdf

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Sexual risk behaviour and its determinants among men who have sex with men in Catalonia, Spain

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To evaluate the prevalence of sexual risk behaviours among men who have sex with men (MSM) in Catalonia and to identify sociodemographic, psychosocial, and behavioural factors associated with unprotected anal intercourse (UAI) with casual partners a convenience sample of 850 MSM was recruited in 2006. An anonymous questionnaire was used to explore risk behaviours during the previous 12 months. Logistic regression models were used to examine the variables associated with UAI. Mean age was 41 years and 20.4% were immigrants. Among those with casual partners (91.7% of all respondents), 31.4% had UAI. The multivariate analysis revealed that the likelihood of UAI was higher in men who were HIV-positive (OR: 1.77), used more than four drugs before sex (OR: 4.90 for +6), were not from Spain (OR: 2.10 for Latin American; OR: 1.86 for other immigrants), had more than 20 sexual partners (OR: 1.56), met casual sex partners on the Internet (OR:1.45) and presented a high level of internalised homophobia (OR: 2.40). HIV/STI prevention programmes for MSM in Catalonia should incorporate activities that strengthen self-esteem, take into account the impact of internalised homophobia, and adapt to the sociocultural reality of immigrants. Furthermore, these programmes should also address substance abuse and alert HIV-positive men about the risk of HIV re-infection and transmission of other STI.

Introduction

In Europe, we have recently witnessed an increase in the number of new diagnoses of HIV infection in men who have sex with men (MSM) [1,2] and in the number of other sexually transmitted infections (STI) [3] in particular among HIV-positive MSM [4].

In Catalonia, voluntary reporting of newly diagnosed HIV infections was implemented in January 2001 and a total of 4,082 cases were reported between January 2001 and December 2006. Of these, MSM accounted for 43.4% of male HIV cases in 2001-2006 [5]. Although there are no recent data on the true incidence of HIV in this group, a study on recently acquired infections in Spain found that MSM constituted 62.5% among the recent infections identified with the STARHS technique during 2003-2005, which seems to indicate that we may be seeing an increase in the number of new infections in this group [6].

The resurgence of syphilis and other STI in Barcelona reflects a trend of increasing risk behaviour in MSM, a notable proportion of whom are HIV-positive [7,8]. Recently, an outbreak of lymphogranuloma venereum was reported among MSM in Barcelona [9]. Moreover, a significant growth in the HIV prevalence among MSM (from 14.2% in 1995 to 19.8% in 2006) has been observed in the sentinel surveillance system in Catalonia [5].

These increases in the prevalence of HIV infection and other STI are consistent with the increase in risk behaviours observed in MSM in other European cities [10,11]. For example, data from different surveys carried out in London in 1998 and 2003 showed an increase in the percentage of men reporting high risk sexual behaviour with a casual partner from 6.7% to 16.1% [12]. Studies in Catalonia have also shown a growing trend in reported sexual risk behaviours such as high number of sexual partners and unprotected anal intercourse (UAI) [5,13]. Among the reasons some authors give for these increases, particularly noteworthy are the use of alcohol and drugs before and during sexual intercourse [14,15] and the use of Internet to search for and meet partners [16,17]. Furthermore, psychosocial factors such as externalised and internalised homophobia and discrimination can lead to low self-esteem that can in turn lead to an increase in risk behaviours, difficulties when negotiating safe sex, and substance abuse [18-20].

A more in-depth analysis of the factors responsible for high-risk sexual practices is necessary in order to improve the design of preventive interventions aimed at reducing transmission of HIV and other STI in this group. The objectives of this study were to estimate the prevalence of reported sexual risk behaviours among MSM recruited in 2006 in Catalonia and to identify possible sociodemographic, psychosocial, and behavioural factors associated with UAI with casual partners.

Methods

HIV/STI behavioural surveillance among MSM began in Catalonia in 1993 as part of the Integrated HIV/STI Surveillance System

(SIVES) [5]. To date, seven cross-sectional studies have been carried out in collaboration with the association Stop Sida. For the purpose of the present study, we analysed data from the most recent survey carried out in 2006. Given the difficulty in obtaining a representative sample of MSM, and with the aim of maximising the diversity of the group studied, we took a convenience sample from three saunas, two sex-shops, seven bars, and a public park that is frequented by gay men. These sites were selected from a larger list of gay venues screened prior to the survey and considered to represent a wide cross-section of MSM in Barcelona. Over a six-week period, four volunteers from Stop Sida handed out 2,735 questionnaires at the different sites. In addition, during the last weeks of recruitment, further 1,166 questionnaires were sent to all the members of the Coordinadora Gay-Lesbiana de Cataluña (Gay-Lesbian Coordination Organization of Catalonia). It was possible to distinguish the questionnaires returned from the gay venues from those sent to the mailing list. The questionnaires were anonymous and self-administered and were accompanied by a prepaid envelope to be sent by post.

The questionnaire used was adapted from the one that had been developed and validated by the University Institute of Social and Preventive Medicine in Lausanne, Switzerland [21]. Questions on sexual behaviour referred to the period of 12 months preceding the survey. The information collected included sociodemographic characteristics such as age, educational level, and country of origin. Respondents were also asked about their sexual orientation and whether they had experienced insults or aggression. The level of internalised homophobia, that is the negative attitude men have about their homo/bisexuality, was estimated using seven statements on acceptance of their sexuality in which the replies went from 1 (totally agree) to 4 (do not agree) [22]. Once the internal consistency of the replies was calculated (Cronbach alfa, 0.823),

Table 1

Sociodemographic and psychosocial characteristics and prevalence of HIV infection and other STI in a convenience sample of men who have sex with men in Catalonia, 2006 (n=850)

	n	%
Recruitment site		
Sauna	243	28.6
Sex-shop	204	24.0
Park	82	9.6
Bar	107	12.6
Coordinadora Gay-Lesbiana	214	25.2
Age (years)		
19-30	106	12.7
>30	728	87.3
University education	446	53.2
Immigrant	173	20.4
Sexual orientation		
Homosexual	756	89.2
Bisexual	72	8.5
Heterosexual	4	0.5
Not resolved or does not know	16	1.8
Degree of internalised homophobia[1]		
1-2.5	63	7.5
>2.5-4	774	92.5
Insults and/or attacks (previous 12 months)	93	11.0
HIV test (at any time)	737	86.8
Self-reported prevalence of HIV[2]	139	19.7
STI (at any time)	535	64.5
STI (previous 12 months)[3]		
Syphilis	27	3.3
Gonorrhoea	40	4.8
Urethritis	21	2.5
Herpes	14	1.7
Pubic lice	64	7.7
Genital warts	20	2.4

[1]Heterosexuals excluded;
[2]Among those who had the HIV test and reported the results;
[3]Non-exclusive categories.

Table 2

Sexual behaviour and use of alcohol and drugs before or during sexual intercourse in the previous 12 months in a convenience sample of men who have sex with men in Catalonia, 2006 (n=850)

	n	%
Use of alcohol	533	63.8
Use of drugs[1]		
Cannabis	217	26.0
Cocaine	157	18.8
Amphetamine	38	4.6
Poppers	341	40.8
Viagra	110	13.2
Ketamine	42	5.0
Methamphetamine	25	3.0
Number of drugs used		
0	365	44.3
1-3	378	45.9
4-6	65	7.9
More than 6 drugs	15	1.8
Number of male sexual partners		
1-10	296	35.8
11-20	160	19.3
More than 20	371	44.9
Sex with a stable partner	453	55.4
Sex with a casual partner	776	91.7
UAI with a casual partner[2]	233	31.4
Meet casual partners on the Internet	353	42.4
Has charged for sex	34	4.1

[1]Non-exclusive categories;
[2]Among those who reported having a casual partner;
UAI: unprotected anal intercourse

Table 3

Factors associated with unprotected anal intercourse with casual partners (previous 12 months) in a convenience sample of men who have sex with men in Catalonia, 2006. Univariate logistic regression analysis.

	UAI %	OR	95% CI	p
Age (years)				
19-30	35.6	1.00		
>30	31.2	0.82	0.51-1.31	0.400
Recruitment site				
Gay venues	32.2	1.00		
Mailing list: Coordinadora Gay- Lesbiana	28.4	0.83	0.57-1.22	0.346
Country of origin				*0.002*
Spain	26.4	1.00		
Immigrant (Latin America)	45.1	2.28	1.43-3.64	0.001
Immigrant (other)	40.9	1.93	1.13-3.29	0.017
No answer	32.4	1.33	0.90-1.96	0.149
Educational level				
Non-university	32.2	1.00		
University	30.5	0.92	0.68-1.27	0.629
Sexual orientation				
Homosexual	30.5	1.00		
Other[1]	39.0	1.46	0.91-2.35	0.116
Insults and/or attacks[2]				
No	30.3	1.00		
Yes	41.3	1.61	1.00-2.60	0.048
Internalised homophobia[3]				
>2.5-4	30.1	1.00		
1-2.5 (high)	45.5	1.94	1.13-3.34	0.016
Use of alcohol[2]				
No	32.7	1.00		
Yes	31.1	0.93	0.67-1.29	0.667
Number of drugs used[2]				*<0.001*
No	26.6	1.00		
1-3	31.5	1.27	0.90-1.79	0.172
4-6	46.8	2.43	1.39-4.25	0.002
More than 6 drugs	76.9	9.21	2.47-34.31	0.001
Sex with a stable partner[2]				
No	32.5	1.00		
Yes	28.8	0.84	0.61-1.16	0.294
Number of male sexual partners[2]				*<0.001*
1-10	24.7	1.00		
11-20	23.7	0.95	0.58-1.54	0.831
More than 20	39.1	1.96	1.35-2.86	0.000
Met casual partners on the Internet[2]				
No	27.5	1.00		
Yes	35.7	1.46	1.07-2.00	0.017
Have you charged for sex[2]				
No	30.6	1.00		
Yes	45.5	1.89	0.93-3.82	0.076
STI[2]				
No	30.4	1.00		
Yes	35.2	0.81	0.55-1.18	0.271
Self-reported HIV result				
Negative/unknown	28.6	1.00		
Positive	43.8	1.95	1.32-2.89	0.001

[1]Bisexual, heterosexual, not resolved, or does not know;
[2]Previous 12 months;
[3]Heterosexuals excluded;
OR: Odds ratio

the variable was calculated for each individual as the mean of responses to the seven statements using values ranging from 1 (high internalised homophobia) to 4 (no internalised homophobia). Furthermore the questionnaire collected data on the use of Internet to make contact with sexual partners, sexual practices with stable and casual partners, use of condoms, number of sexual partners, use of alcohol and drugs before or during sexual intercourse, self-reported HIV serostatus, and previous STI. UAI with casual partners was defined as inconsistent use of condoms during anal intercourse with these partners in the previous 12 months.

Univariate and multivariate logistic regression models were used to evaluate the sociodemographic, psychosocial, and behavioural variables associated with UAI. A final multivariate model was performed with inclusion of all variables that were significantly associated with UAI in univariate models (p value <0.10) and remained significantly associated in the final multivariate model. Adjusted odds ratio (AOR) and their respective 95% confidence intervals (CI) were calculated. The calibration of the models was tested using the Hosmer-Lemeshow goodness-of-fit test. Statistical significance was set at 0.05.

Results

Of the 3,901 questionnaires distributed, 877 were returned, giving the response rate of 22.5% (23.9% for questionnaires handed out at gay venues and 19% for those sent to the mailing list). The analysis was carried out among men who reported having had sexual relations with men during the previous 12 months (n=850). Of the men included in the study, the mean age of the respondents was 41 years (range19-76), more than half had a university education, and 20.4% were immigrants, mainly from Latin America (11.5%). Most men reported that their sexual orientation was homosexual (89.2%), further 8.5% characterised themselves as bisexual; and 11.0% of the respondents had experienced insults and/or attacks in the previous year because of their sexual orientation. We found that 7.5% of homo/bisexuals had a high degree of internalised homophobia with values lower than 2.5 (Table 1).

The self-reported prevalence of HIV infection among those who had been tested for HIV and gave their result was 19.7%. As for STI, 64.5% reported having had an infection in their lifetime, and 4.8% and 3.3% reported having been diagnosed with respectively gonorrhoea and syphilis during the previous year (Table 1). Among

Table 4

Factors associated with unprotected anal intercourse with casual partners (previous 12 months) in a convenience sample of men who have sex with men in Catalonia, 2006. Final multivariate logistic regression model*

	AOR	95% CI	p
Country of origin			*0.014*
Spain	1.00		
Immigrant (Latin America)	2.10	1.24-3.56	0.006
Immigrant (other)	1.86	1.04-3.32	0.036
No answer	1.37	0.88-2.12	0.161
Internalised homophobia[1]			
>2.5-4	1.00		
1-2.5 (high)	2.40	1.25-4.64	0.009
Number of drugs used[2]			*0.05*
No	1.00		
1-3	1.11	0.76-1.62	0.590
4-6	1.76	0.95-3.25	0.071
More than 6 drugs	4.90	1.23-19.5	0.024
Number of male sexual partners[2]			*0.002*
1-10	1.00		
11-20	0.71	0.42-1.21	0.208
More than 20	1.56	1.03-2.38	0.036
Met casual partners on the Internet[2]			
No	1.00		
Yes	1.45	1.10-2.06	0.042
Self-reported HIV result			
Negative/unknown	1.00		
Positive	1.77	1.14-2.74	0.011

AOR: adjusted odds ratio;
1Heterosexuals excluded;
2Previous 12 months;
*Hosmer-Lemeshow test: 0.303

HIV-positive men these percentages were higher – 8.8% and 9.5%, respectively.

There was a high prevalence of drug use before or during sexual intercourse in the previous 12 months. The most widely used were poppers, cannabis, and cocaine (40.8%, 26%, and 18.8%, respectively); 28.6% consumed two or more different drugs (Table 2).

Almost half (44.9%) of those surveyed reported having had sexual relations with more than 20 male partners and 55.4% reported having had a stable partner in the previous 12 months. Among those who had sexual relations with at least one casual partner in the past 12 months (91.7%), 31.4% had UAI. Of those who had UAI with casual partners, 66.7% never asked the casual partners about their HIV serostatus. Internet had been the medium for finding a casual partner for 42.4% of all respondents, and 4.1% had received money in exchange for sexual relations with other men during the last 12 months (Table 2).

Table 3 shows the univariate logistic regression model for the variables associated with UAI. The final multivariate model showed a significant relationship between country of origin and UAI (Table 4). Immigrants, particularly from Latin America, were more likely to have had UAI with casual partners in the previous 12 months (OR: 1.86 and OR, 2.10, respectively). Furthermore, men who found it difficult to live with their homo/bisexuality and had a high level of internalised homophobia were also more likely to have unprotected sex with casual partners (OR: 2.40). Consuming several drugs (OR, 4.90 for > 6 drugs), the number of sexual partners (OR:1.56 for > 20) and finding casual partners on the Internet (OR: 1.45) were also significantly associated with UAI in the multivariate analysis. Finally, being HIV-positive was associated with a greater probability of having unprotected sex (OR: 1.77).

Discussion

Our results reveal a high prevalence of sexual risk behaviour among MSM in Catalonia, since almost half of the participants reported having had sex with more than 20 partners during the previous year, and 31.4% of those who reported having had casual partners had unprotected sex with these partners. Both these proportions were higher than in previous surveys [5]. These data are consistent with those of other studies [10-12]. Strategies aimed at reducing the risk of HIV transmission, such as serosorting (i.e. looking for partners with the same serostatus in order to maintain unprotected sexual relations), have been described [23-25]. However, these strategies carry an important risk of transmission since in many cases the serostatus is assumed [26,27]. In our study, 66.7% of men who had UAI with casual partners never asked about the serostatus of their partner, although a proportion of the reported UAI could have involved partners with the same serostatus, by chance only. This finding agrees with those of another study in Barcelona in which most of the MSM interviewed reported not having known the serostatus of their partner before engaging in sexual relations [26].

One of the factors associated with UAI is country of origin, as immigrants — particularly those from Latin America — have been described to be at greater risk of HIV infection [28]. In studies carried out among MSM in the United States, Latin Americans reported higher rates of UAI, even in comparison with other minority groups [29]. The racism, homophobia, and poverty these men experience often make it difficult to adopt safe practices and hence increase their vulnerability to HIV/STI.

Psychosocial factors also play a role in protecting oneself from HIV/STI. Our results indicate that those who find it more difficult to live with their sexual orientation and who have negative reactions and attitudes toward their own homo/bisexuality are more likely to engage in sexual risk practices. This is the first time we have analysed in our setting the association among the internalised homophobia and sexual risk behaviours described by other authors [18,19]. On the one hand, internalised homophobia has been reported to be an obstacle to prevention campaigns [18], and, on the other, it has been associated with low self-esteem and greater consumption of alcohol and drugs, which do not favour the practice of safe sex [19]. Future studies should therefore analyse psychosocial aspects in more detail, since they are important risk factors that must be incorporated in prevention messages.

Having a larger number of sexual partners was associated with a greater probability of sexual practices involving a greater risk of HIV/STI. This finding is consistent with those of other European studies [10,30]. Therefore, the increasingly widespread use of Internet as a means of making contact with sexual partners that has been observed in recent years [16,17,31] should be borne in mind, since this medium makes it easier to meet more sexual partners, thus increasing the vulnerability of MSM to HIV/STI. Indeed in our study, MSM who met sexual partners on the Internet were more likely to report UAI with casual partners, and this has also been observed in other studies [16,17]. The association between risky sexual behaviours and meeting partners online needs to be further explored. Online HIV/STI prevention campaigns could prove extremely useful in this group in the future.

Prevention in HIV-positive MSM continues to be a challenge, since this group are more likely than HIV-negative men or men whose serostatus is unknown to engage in sexual risk practices with casual partners, as reported by other authors [28,32]. Some authors stress that HIV-positive men sometimes use serosorting as a risk reduction strategy, although this has not proven efficient for reducing the risk of re-infection by HIV [33] or other STI [4]. Furthermore, a recent study of HIV-positive MSM in the UK highlighted that very few men exclusively practiced serosorting [34]. The reasons for the high prevalence of sexual risk behaviours in HIV-positive MSM include the availability of highly active antiretroviral therapy (HAART), access to Internet, increased substance use, and the stigma or discrimination MSM experience [34].

Finally, in line with other published studies [14,15,35], we found that the use of alcohol and drugs by MSM before and during sex shows a clear association with unprotected sexual relation, which stresses the need to include substance use in future prevention messages.

The main limitation of our study is that we are unable to generalise our results, as the sample was a non-probability sample and, therefore, does not represent all MSM in Catalonia. However, we did try to diversify as much as possible the places and times of the questionnaire distribution in order to minimise this bias. Furthermore, we cannot rule out bias caused by memory or bias caused by underreporting of some risk practices or the self-reported result of an HIV test. Nevertheless, the fact that the questionnaire was self-completed with no identifying personal information could have helped to reduce these types of bias. Another limitation of the

study is the low return rate, although this was greater than in other similar studies [31,36]. Lastly, this is a cross-sectional study and so it is not possible to establish the direction of any association between risk factors and sexual risk practices.

Despite these limitations, we believe that the results of our study provide a valid indication of a high prevalence of sexual risk practices among MSM in Catalonia. This prevalence has increased with respect to previous surveys, which stresses the need to intensify interventions aimed at preventing transmission of HIV/STI in this group. It seems that current prevention campaigns based on spreading information about safe sex are insufficient and fail to address other factors that influence the use of condoms, such as internalised homophobia or social and cultural background. These campaigns should incorporate activities that take into account the impact of internalised homophobia and strengthen self-esteem of gay people, as well as adapt to the sociocultural reality of immigrants. Furthermore, these programmes should also include information on the effects of mixing drugs and sex. Preventive interventions aimed specifically at HIV-positive MSM must be reinforced by insisting on the possibility of HIV re-infection and transmission of other STI and taking into account factors such as stigma and discrimination which often hinder HIV-positive men from taking protective measures against infection. Similarly, new technologies, such as Internet, will play a key role in developing and spreading messages aimed at preventing the transmission of HIV/STI in the future.

Finally, we should attempt to encourage a shift in preventive strategies, from those based only on information campaigns to those based on the implementation of services aimed specifically at MSM which can integrate both preventive and clinical interventions at community level. New diagnostic technologies, such as rapid testing, not only for HIV but also for other STI, provide a good opportunity to expand access to testing, and therefore to counselling and other preventive interventions. Knowledge gained during recent years on network analysis and the role of sexual networks in the spread of HIV should be applied to Internet to deliver preventive interventions to MSM. Bio-behavioural monitoring will continue to be a basic tool to evaluate such approaches.

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Do men who have sex with men use serosorting with casual partners in France? Results of a nationwide survey (ANRS-EN17-Presse Gay 2004)

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We examined whether men who have sex with men (MSM) in France have adopted serosorting with their casual partners, serosorting being one strategy to reduce the risk of HIV transmission. We expected to see the same predictors of this practice with casual partners in France as in other similar MSM communities (HIV-seropositive, Internet dating). Data from a cross-sectional survey was used, based on a self-administered questionnaire conducted among readers of the gay press and users of gay websites in 2004. The study population consisted of MSM who reported their HIV status, as well as the practice of unprotected anal intercourse (UAI) with a casual partner at least once during the previous 12 months. Among 881 respondents included in the analysis, 195 (22%) had practiced serosorting: 14% among HIV-seropositive men and 26% among HIV-seronegative men. Serosorting was independently associated with the use of cruising venues (AOR 0.28, p=0.001) and Internet dating (AOR 2.16, p=0.051) among HIV-seropositive men, whereas it was independently associated with the use of cruising venues (AOR 0.59, p=0.013) and the fact of having less partners (AOR 1.50, p=0.046) among HIV-seronegative men. Serosorting requires an up-to-date knowledge of HIV serostatus for MSM and their UAI casual partners, and does not prevent from acquiring other sexually transmitted infections. Prevention campaigns are needed to underline the risks associated with serosorting.

Introduction

Since 2003, an increase in new HIV diagnoses among men who have sex with men (MSM) has been observed by the mandatory notification system for HIV infection in France [1] as well as in many European countries [2]. During the same period, it was reported that half of MSM diagnosed with syphilis were also HIV-seropositive [3]. More recently, cases of rectal lymphogranuloma venereum (LGV) have been diagnosed exclusively among MSM, most of whom were HIV-seropositive [3]. In 2000, for the first time since its inception in 1985, the French Gay Press Survey (EPG) showed an increase in sexual risk behaviours among MSM [4]. This trend was confirmed by the results of the latest EPG survey, conducted in 2004, in which 33% of respondents reported unprotected anal intercourse (UAI) with casual partners [5] . Among men who had at least one casual partner, UAI was reported by 56% of HIV-positive respondents and 28% of HIV-negative respondents [5]. Similar patterns have been documented since 1996 in the United States [6], Australia [7] and, slightly later, in Europe [8,9].

Recently, sexual behaviours aiming at reducing the risk of HIV transmission have been reported: serosorting with casual partners, negotiated safety with regular partners, strategic positioning, withdrawal before ejaculation [10-13]. The first, serosorting, consists of engaging in unprotected anal sex only with partners of the same HIV serostatus as oneself. This strategy has been described as being used by MSM in several cities in industrialised countries [14-17]. It is mainly employed by HIV-seropositive MSM who use the Internet to find sexual partners [14,16,18]. Osmond et al. showed that this strategy was used most frequently by the 18-29-year-olds [17]. This practice has also been described among HIV-negative men [11,19-22]. To date, serosorting with casual partners has never been studied in France.

The aim of this study was to determine whether MSM who did not use condoms for anal sex with casual partners adopted the strategy of serosorting, and to describe the men thus identified. We expected to see the same predictors of this practice with casual partners in France as in other similar MSM communities worldwide (HIV-seropositive, Internet dating). The study was based on our nationwide gay press and gay website survey carried out in late 2004.

Methods

Survey

The French Gay Press Survey (EPG) was first conducted in 1985. It was repeated each year until 1993, and subsequently every three or four years. The recruitment protocol has been unchanged since 1985. It consists in placing a questionnaire inside gay magazines with large readerships, and inviting readers to complete it on a voluntary basis. Questionnaires are returned to the French Institute for Public Health Surveillance (Institut de veille sanitaire, InVS). During the last survey in 2004, for the first time, the questionnaire was also posted on gay websites. The magazines and websites could be of a general or pornographic, national or regional character. Sixteen gay magazines and ten gay websites made available the questionnaire between July and October 2004, and responses were collected until February 2005.

The self-administered questionnaire comprised 100 wide-ranging questions on the respondent's sociodemographic characteristics, social and sexual life, sexual practices, history of sexually transmitted infection (STI), and self-reported HIV serostatus. Specifically, some questions addressed the respondent's sexual behaviour in the previous 12 months, including the number of male sexual partners, the type of sexual practices (e.g. anal sex), and the number of UAI; further questions focussed on the respondent's sexual risk behaviours, if any, with regular or casual partners. Respondents who had had at least one casual partner during the previous 12 months were asked about their sexual practices with those casual partner(s), and their knowledge of the HIV serostatus of UAI partners.

For 20 years, this survey has aimed at monitoring preventive sexual behaviours, lifestyles and sociability among MSM. The EPG survey constitutes one part of the French sexual behavioural MSM surveillance program; some questions are kept similar in each

Figure

Number of respondents meeting the inclusion criteria for the analysis of serosorting, France (ANRS-EN17-Presse Gay 2004)

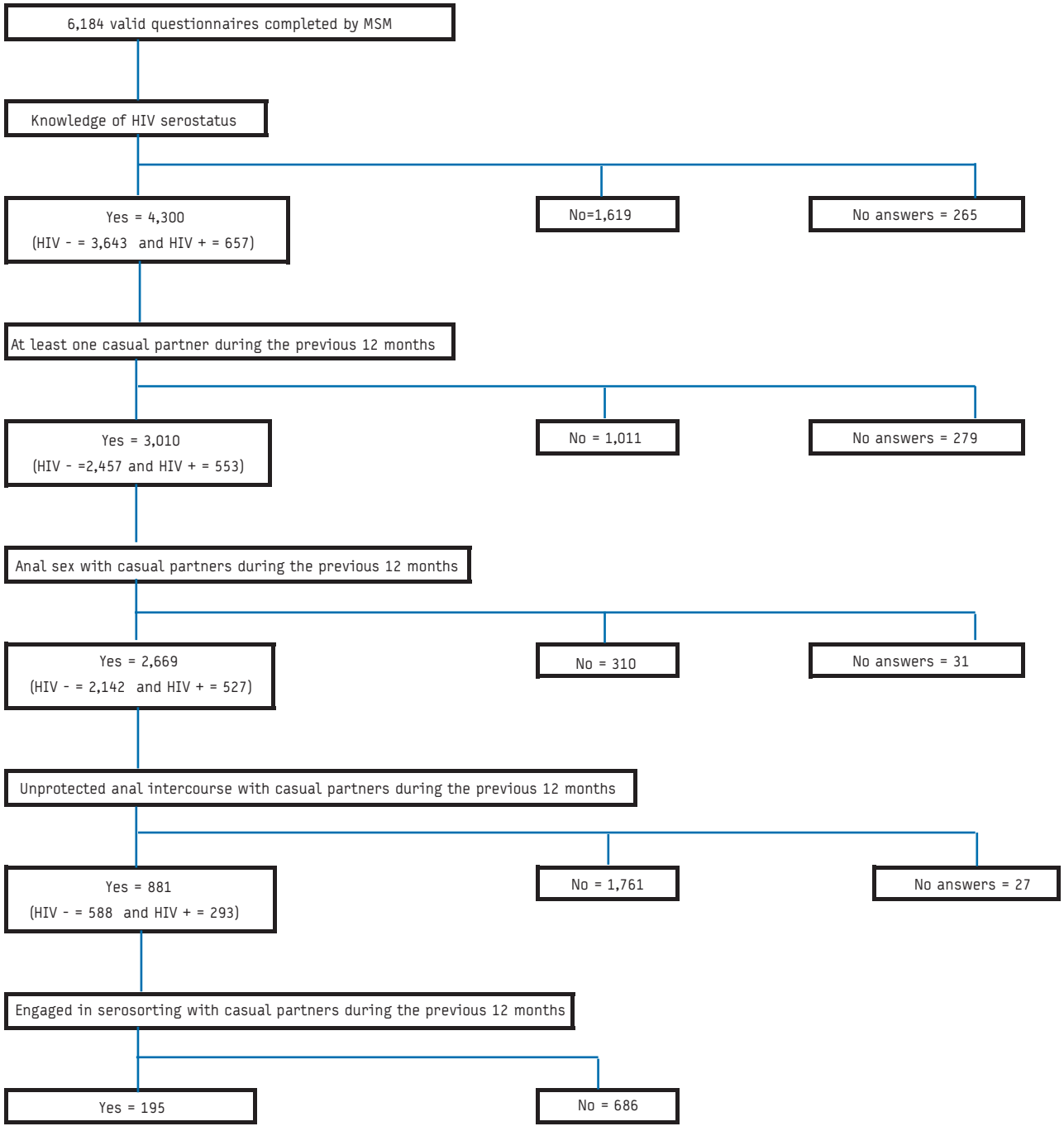

Table 1

Sociodemographic characteristics, sexual practices and HIV testing history of respondents who had unprotected anal intercourse with a casual partner at least once in the previous 12 months, according to the use of serosorting, France (ANRS-EN17-Presse Gay 2004)

	Serosorting					
	Yes			No		
	N	%		n	%	
	195	22.1		686	77.9	
Categorical variables	N	%		n	%	p
Type of questionnaires						
Pen and paper questionnaires	139	71.3		494	72.0	0.842
Online questionnaires	56	28.7		192	28.0	
Education						
High school or lower	77	39.9		261	38.3	0.682
University	116	60.1		421	61.7	
Residence						
Paris region	80	46.0		254	41.2	0.257
Other regions of France	94	54.0		363	58.8	
Living						
Alone	108	56.0		375	54.9	0.893
With a man (couple)	56	29.0		210	30.8	
Other	29	15.0		98	14.3	
Sexual orientation						
Gay / homosexual	172	89.6		609	89.6	0.992
Other	20	10.4		71	10.4	
Looking for sexual partners in backrooms						
Yes	72	37.7		320	47.1	0.022
No	119	62.3		360	52.9	
Looking for sexual partners in saunas						
Yes	70	36.6		330	48.5	0.004
No	121	63.4		350	51.5	
Looking for sexual partners in cruising venues						
Yes	58	30.4		343	50.4	<0 .001
No	133	69.6		337	49.6	
Looking for sexual partners on websites						
Yes	111	58.1		347	51.0	0.083
No	80	41.9		333	49.0	
Drinking over five glasses of alcohol, on consumption days						
Yes	30	18.4		119	21.2	0.435
No	133	81.6		442	78.8	
Drug use (at least one product except cannabis)						
Yes	46	24.1		214	31.4	0.051
No	145	75.9		468	68.6	
Oral sex with casual partners (previous 12 months)						
No oral sex	1	0.6		2	0.3	0.969
Always protected oral sex	5	2.8		19	3.0	
No sperm exposure during unprotected oral sex	58	32.4		209	32.6	
Sperm exposure during oral sex	115	64.2		411	64.1	
At least one STI (previous 12 months)						
Yes	33	17.0		155	22.8	0.085
No	161	83.0		526	77.2	
Self-reported HIV serostatus						
Negative	155	79.5		433	63.1	<0 .001
Positive	40	20.5		253	36.9	
Continuous variables	Median	Range		Median	Range	k-s
Age	35.5	17-72		37	19-64	0.300
Years of sex with male partners	19	1-55		19	2-48	0.164
Number of sexual partners (previous 12 months)	12	1-400		20	1-900	0.003
Number of HIV tests (previous 2 years)	2	0-24		2	0-30	0.699

As not all questions were answered by all respondents, the total numbers for each variable can be different.

Table 2

Factors associated with serosorting among HIV-seronegative respondents reporting unprotected anal sex with casual partners during the previous 12 months, France (ANRS-EN17-Presse Gay 2004) – final multivariate model (n=576)

	N	%	OR	Adjusted OR	95% CI	p
Looking for sexual partners in cruising venues						
No	103	31.4	1	1		
Yes	48	19.0	0.51	0.59	0.39 to 0.89	0.013
Looking for sexual partners on websites						
No	70	23.9	1			
Yes	81	28.2	1.25			
Drug use (at least one product except cannabis)						
No	117	26.9	1			
Yes	35	23.5	0.83			
Number of sexual partners						
Over 10 partners	65	21.0	1	1		
1 to 10 partners	89	32.5	1.81	1.50	1.00 to 2.23	0.046
Looking for sexual partners in backrooms						
No	107	27,6	1			
Yes	44	22.9	0.78			
Looking for sexual partners in saunas						
No	102	29.7	1			
Yes	49	20.7	0.62			
Younger than 30 years						
No	113	27.5	1			
Yes	39	26.2	0.94			

Hosmer-Lemeshow test: chi-squared = 1.36; p = 0.506

Table 3

Factors associated with serosorting among HIV-seropositive respondents reporting unprotected anal sex with casual partners during the previous 12 months, France (ANRS-EN17-Presse Gay 2004) – final multivariate model (n=291)

	n	%	OR	Adjusted OR	95% CI	p
Looking for sexual partners in cruising venues						
No	30	21.1	1	1		
Yes	10	6.7	0.27	0.28	0.13 to 0.60	0.001
Looking for sexual partners on websites						
No	10	8.3	1	1		
Yes	30	17.5	2.34	2.16	1.00 to 4.67	0.051
Drug use (at least one product except cannabis)						
No	28	15.7	1			
Yes	11	9.9	0.59			
Number of sexual partners						
Over 10 partners	33	14.4	1			
1 to 10 partners	7	11.9	0.80			
Looking for sexual partners in backrooms						
No	12	13.2	1			
Yes	28	14.0	1.07			
Looking for sexual partners in saunas						
No	19	14.8	1			
Yes	21	12.9	0.85			
Younger than 30 years						
No	36	13.8	1			
Yes	0	0	0			

Hosmer-Lemeshow test: chi-squared = 0.6; p = 0.743

survey in order to follow trends in key sexual behavioural indicators. This survey was not originally designed to study serosorting. Only the most recent survey of 2004 collected data suitable for interpretation regarding serosorting.

Data collection

HIV serostatus at the time of the questionnaire was self-reported by those respondents who stated that they had had at least one HIV test during their lifetime. Respondents were asked if they had UAI with casual partner(s) during the last 12 months. When this was the case, the HIV serostatus of their casual partner(s) was then investigated using the three following questions: "If you had unprotected anal sex with one or more casual partner(s): were there any whom you knew to be seronegative (yes/no)? Were there any you knew to be seropositive (with or without AIDS) (yes/no)? Where there any whose HIV serostatus you did not know (yes/no)?" The answers were then combined in order to deduce whether respondents practiced serosorting with casual partners or not, as the term "serosorting" itself was not used in the questionnaire.

Respondents were considered to have practiced serosorting with casual partners when they stated that they knew their own HIV serostatus (negative or positive) and that, during the previous 12 months, they had had UAI with one or more casual partners exclusively of the same HIV serostatus as themselves. Respondents who knew their HIV-serostatus and who had had UAI with a casual partner of different or unknown HIV serostatus at least once in the previous 12 months were considered not to practice serosorting. We used these restrictive criteria for serosorting because in the questionnaire no information was collected on the notion of intention or on the HIV serostatus of casual partners with whom condoms were used.

Information on where respondents met their casual partners, such as bars, venues with anonymous sex (saunas, backrooms, cruising venues) or Internet, was collected through a multiple-choice question "Where did you meet your male partners in the previous 12 months?". Drug use was investigated through questions on the consumption of poppers, ecstasy, cocaine, heroin, amphetamines, and hallucinogens during the previous 12 months. All answers were combined in order to have information on the use or not of at least one of these substances.

Participants

Among the 6,184 MSM who completed the questionnaire during the 2004 survey, self-reported HIV prevalence was 13% (n=657). The serosorting analysis was restricted to respondents who reported their HIV serostatus (positive, with or without AIDS, or negative), and who reported having UAI with a casual partner at least once during the previous 12 months. The algorithm used to detect serosorting is shown in the Figure.

Accordingly, 1,884 (27%) respondents were excluded, because they did not know or report their HIV serostatus. Subsequently, those who reported no casual partner (n=1,290), no anal sex with casual partners (n=341) and no unprotected anal sex with casual partners (n=1,788) were also excluded. In the end we analysed data from a sample of 881 respondents.

Statistical analysis

Descriptive statistics were used to compare the sociodemographic characteristics and sexual behaviour of men who did and did not practise serosorting. Univariate analysis was used to identify factors associated with serosorting and to select variables for inclusion in multivariate analysis (Pearson's test or the non parametric chi-squared test). The threshold for statistical significance was set at 0.10. To identify factors independently associated with serosorting according to HIV status, two stepwise descending multivariate regression analyses were used, eliminating variables with no significant effect at the 5% level.

The Wald test was used for categorical variables. The Hosmer-Lemeshow test was used to assess the goodness-of-fit of the resulting models. All analyses were carried out with STATATM software version 8.

Results

The final analysis focused on 881 respondents who stated their HIV serostatus and reported having had UAI with a casual partner at least once during the previous 12 months. The average age of these respondents was 37.3 years. The educational level was high: 61% of the sample had attended university. The majority (63%) lived in urban areas of more than 100,000 inhabitants. HIV-positive status was self-reported by 33% of respondents. Half of respondents used traditional gay meeting places such as bars, saunas, backrooms, cruising venues; the same proportion looked for sexual partners through websites. The use of psychoactive substances was frequent (30%). The median number of sexual partners in the previous 12 months was significant: 20 (range: 1-400). Of these respondents, 195 (22%) practiced serosorting when engaging in UAI with casual partners, while the remaining 686 respondents (78%) did not.

Univariate analysis

The respondents who did and did not practice serosorting with casual partners were not significantly different with respect to age (35 and 37 years), educational level, or area of residence (Table 1). Men in both groups had an equally marked gay community lifestyle with strong self-definition of their homosexual identity and a long history of sex with men (19 years in both groups). The frequency of HIV serotesting did not differ between the groups, including the HIV-seronegative subpopulation (median 2 tests). A history of at least one STI in the previous 12 months was similarly frequent in both groups.

In contrast, the two groups differed significantly in terms of their HIV serostatus distribution, the number of male partners during the previous 12 months, the use of anonymous gay venues to meet sexual partners, and drug use. Among HIV-seropositive respondents, 14% practiced serosorting whereas among HIV-seronegative men this proportion was 26%. Respondents who practiced serosorting had fewer male sexual partners during the previous 12 months than respondents who did not practice serosorting (median 12 vs 20 partners) and were less likely to meet sexual partners in venues where sex is generally anonymous (backrooms, saunas and cruising venues). Respondents who practiced serosorting were slightly more likely than other respondents to use the Internet to meet sexual partners. Recreational use of psychoactive substances was less frequent among respondents who practiced serosorting than among other respondents (respectively 24% and 31%).

Multivariate analysis

In the multivariate analysis on HIV-negative respondents, 2.0% of the data were missing. In the final multivariate model (Table 2), serosorting of casual partners during the previous 12 months was associated with the use of cruising venues and the number of partners. For HIV-negative men, having 10 or less sexual partners was positively associated with serosorting (AOR 1.50), whereas the use of cruising venues was negatively associated with serosorting

(AOR 0.59). No other variables were independently associated with serosorting. The final model had a good fit (Hosmer and Lemeshow test, p>0.05).

In the multivariate analysis on HIV-positive respondents, less than 1% of the data was missing. In this final multivariate model (Table 3), serosorting of casual partners during the previous 12 months was associated with the use of cruising venues and Internet dating. For HIV-positive men, Internet dating was positively associated with serosorting (AOR 2.16), whereas the use of cruising venues was negatively associated with serosorting (AOR 0.28). No other variables were independently associated with serosorting. The final model had a good fit (Hosmer and Lemeshow test, p>0.05).

Discussion

This study represents the first attempt to explore the practice of serosorting with casual partners by MSM in France, as data from previous surveys were not suitable for this investigation. Among the respondents who stated they had had UAI with a casual partner on at least one occasion during the previous 12 months, 22% (n=195) were considered to have engaged in serosorting with casual partners.

In our study, the characteristics of MSM who practiced serosorting with casual partners were very similar to those of MSM who did not, although serosorters represented 26% of HIV-seronegative MSM and 14% of HIV-seropositive MSM. The multivariate analyses identified variables independently associated with serosorting: HIV-seronegative MSM were far more likely to serosort when they had less partners, and HIV-seropositive MSM practiced serosorting more frequently when they used Internet dating, whereas MSM who attended cruising venues were less likely than other MSM to serosort regardless of their HIV-status.

Our findings are similar to those found in other studies carried out in industrialised countries, where HIV-seropositive MSM who serosort are more likely to look for sexual partners on websites [14,16,18]. However, our study did not find that HIV-seropositive MSM were more likely than HIV-seronegative MSM to serosort [10,13,16].

This cross-sectional survey was based on a convenience sample, a method widely used for surveys related to MSM [23]. This is mainly due to the difficulties of recruiting a sufficiently large sample of MSM through representative general-population-based surveys. It has been suggested that respondents recruited through the press have a more established sexual identity and sex life, and tend to be exclusively homosexual. They also tend to have confident attitudes and an interest in questions relating to HIV prevention, at least enough to answer a long questionnaire on sexual risk behaviours [24]. This selection bias probably results in an underestimation of sexual risk behaviours among MSM. A social desirability bias may compound this problem, although it should be limited by the use of a self-administered questionnaire.

In this study, the serosorting indicator was constructed retrospectively, based on answers to three questions relating to the HIV serostatus of casual partners with whom respondents had UAI. Only respondents who indicated that they had had UAI with casual partners whose HIV serostatus was identical to theirs were considered to have practiced serosorting. In other words, MSM who reported having also had partners of unknown or discordant HIV serostatus were classified as not using serosorting.

The definition of serosorting used in this study is restrictive, mainly because of the constraints imposed by initial material collected through the questionnaire. No information was collected concerning casual partners' HIV status when condoms were used. The term "serosorting" was not used in the questionnaire, and respondents were not asked about their intention of choosing casual partners according to their HIV status. Hence it was impossible to assess whether those who were considered to have practiced serosorting did so deliberately or not. Likewise, no data contributed to evaluate whether the knowledge of partners' serostatus was the respondent's assumption or the result of direct discussion between partners. Similarly to some other researchers, the implementation of negotiated safety practices in regular partnerships, especially by HIV-negative men, was not taken into account in our definition of serosorting [21,22,25].

Serosorting is a recent concept, its definition is still being developed and no consensus has been reached in literature so far [13,15,21]. This explains why the comparison of our results with those of other studies is difficult. Taking into account all the limitations due to the nature of our data, our outcome may be considered an estimation of casual seroconcordance rather than serosorting.

The frequency of serosorting may either be overestimated or underestimated, depending on whether a sub-sample or the total sample is taken into account. Indeed, the rate of serosorting may be expressed as a proportion of UAI respondents with a given HIV serostatus only [25], but it may also be evaluated by a ranking of sexual risks behaviours which is applied to all respondents [15,17,19,21]. Nonetheless, in our study, intentional serosorting and seroconcordance by chance could not be distinguished and measured. If the whole sample of respondents had been selected for analysis, it would have meant that the implementation of a risk reduction strategy was intentionally adopted when deciding to have sexual intercourse; this hypothesis being an overstatement.

Our findings show that a large proportion of HIV-seronegative respondents had seroconcordant UAI with casual partners. This is not surprising given that the probability of finding HIV-seronegative partners is much higher than the probability of finding HIV-seropositive partners. Nevertheless, our results highlight at-risk behaviours. Indeed, we focused on MSM who practiced UAI with casual partners, and our results may therefore suggest that serosorting was practiced instead of condom use by some HIV-seronegative MSM. For HIV-seronegative MSM, the practice of serosorting implies the need for an up-to-date knowledge of their own HIV serostatus obtained through regular screening. However, we found no difference in the frequency of HIV testing in the previous two years between MSM who practiced serosorting and those who did not. Therefore, our findings, consistent with those reported in other research work, suggest that a fraction of MSM who believe themselves to be HIV seronegative could in fact be infected [26]. Recently, Williamson et al. reported that 41% of men who tested HIV-seropositive were unaware of their status, although less than half of them reported having had a negative test in the previous 12 months [27]. This highlights one major problem related to serosorting, namely the difficulty of being certain of one's own HIV seronegativity. The practice of serosorting by HIV-seronegative individuals as an alternative to condom use for preventing HIV infection has been addressed in previous studies [11,28]. In populations with a high incidence of HIV infection, incorrect HIV serostatus assumptions are not that rare, even among individuals

who have had frequent HIV screening tests during the previous year. Recent studies have raised the possibility that serosorting could in fact increase the risk of HIV transmission [19,29]. In contrast, in the specific case of HIV-negative regular partnerships, the negotiated safety has been confirmed to be protective from HIV infection [20].

The rationale of serosorting is also based on the knowledge of a casual partner's serostatus, as stated during preliminary conversation. It requires for users of this strategy to obtain accurate information on the HIV serostatus of each casual partner before engaging in unprotected sex, without assuming serological concordance from the outlook or seroguessing [22]. This issue may be relatively simple to discuss with partners in established relationships, but direct discussion may be more problematic with casual partners encountered in anonymous venues. In fact, we found that participants who attended cruising venues were less likely to serosort, probably because this type of venues tend to encourage immediate anonymous sex, making it more difficult to broach the subject of HIV/AIDS [30].

The use of Internet to meet sexual partners was associated with serosorting for HIV-seropositive respondents, as reported in some studies [15,17,31]. Indeed, it may be easier to disclose one's HIV seropositivity to potential sexual partners during online encounters, especially on "positive-seeking-positive" websites [18]. However, for HIV-seronegative MSM, the HIV-seronegativity of potential sexual partners is as uncertain on the Internet as in other venues. A great deal of sincerity from both partners is required to disclose a person's HIV serostatus, whatever it is.

If the use of psychoactive substances was not independently associated with serosorting, having less partners was predictive of using serosorting among HIV-negative men. Just like in the beginning of the HIV pandemic, MSM who serosorted tended to use other sexual harm-reduction practices [32], which were a smaller number of sexual partners and a lower level of drug use; these are consistent with the time necessary to discuss serostatus and the fact that serosorting requires a high degree of self-control [30].

In our study, serosorting was constructed retrospectively from a behavioural survey. As mentioned, the definition we used did not include notions of intention nor discussions on HIV status, hence limiting interpretations. These new questions will be added to the next EPG survey.

In a context of increasing sexual risk behaviours in France, particularly among HIV-seropositive MSM, the proportion of MSM who practice UAI seroconcordance with casual partners (22%) can be considered relatively large. On the other hand, 78% of MSM practiced UAI with casual partners of unknown or discordant HIV serostatus. Moreover, among all respondents of the EPG survey, a large proportion was unaware of their own HIV serostatus (27%). All these events are consistent with the increase of the number of new HIV diagnoses among MSM in France. HIV prevention campaigns promoting screening and condom use must be pursued. An important limitation of serosorting as a risk reduction strategy is the fact that it exposes both HIV-seronegative and HIV-seropositive men to a high risk of STI [15,33]. Our results call for the implementation of additional programs to alert HIV-seronegative MSM to the limitations of serosorting casual partners, with respect to the risk of all STI, including HIV/AIDS. HIV-seropositive MSM also need to be more aware that serosorting does not prevent STI transmission.

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Epidemiology of herpes simplex virus types 2 and 1 amongst men who have sex with men attending sexual health clinics in England and Wales: implications for HIV prevention and management

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The objective was to investigate herpes simplex virus (HSV) epidemiology amongst HIV-positive and HIV-negative men who have sex with men (MSM) in England and Wales. Unlinked anonymous sera from 3,968 MSM attending 12 sexual health clinics in 2003 were tested for HIV, HSV-2 and HSV-1 antibodies. Fifty-five percent of HIV-positive MSM were HSV-2-seropositive, compared to 17% of HIV-negative MSM (Adj RR: 2.14 [CI: 1.92-2.37]). Amongst HIV-positive individuals, there was no significant difference in HSV-2 seroprevalence by knowledge of HIV status or whether the HIV infection was recently acquired (determined through STARHS). HIV infection was also independently associated with HSV-1 serostatus (Adj RR 1.19 [CI: 1.14-1.24)]). Four of the twelve attendees who received a diagnosis of recurrent anogenital herpes at the clinic visit were HSV-1-seropositive but not HSV-2-seropositive at the time, although no cultures or PCR results were available to type the cause of the ano-genital presenting disease. It is of concern that one in two HIV-positive MSM and one in six HIV-negative MSM may be infected with HSV-2, given increasing evidence of its impact on HIV progression, onward transmission and acquisition. To date results have been disappointing from trials aimed at reducing HIV onward transmission and HIV acquisition using HSV antiviral medication. However, recent research in an African context demonstrates the efficacy of HSV antivirals in delaying HIV progression. The high prevalence of HSV-2 amongst HIV-positive MSM suggests that an increased focus on HSV control in the management of HIV amongst MSM in the United Kingdom (UK) may be warranted. Given this and existing research on the high prevalence of genitally acquired HSV-1 amongst MSM in the UK, further research is also warranted into the role of HSV-1 in the HIV epidemic in this context.

Introduction

Genital herpes is caused by infection with herpes simplex types 2 and 1 (HSV-2 and HSV-1). There is increasing evidence from biological and epidemiological studies of the link between HSV-2 and the HIV epidemic. Research has shown that for HIV-positive individuals, frequent asymptomatic HSV-2 reactivations are associated with increased HIV viral load and genital shedding. In addition, HSV-2 suppression using antivirals reduces HIV viral load and genital shedding [1-3]. Whilst trials to date have failed to find evidence that HSV antivirals can reduce onward HIV transmission [1,2,4], the recent Partners In Prevention (PIP) trial has demonstrated that HSV antivirals can significantly reduce HIV progression according to key indicators amongst HIV-positive HSV-2-positive African men and women [4]. For HIV-negative individuals, HSV-2 infection increases the risk of HIV acquisition more than two-fold [1,3,5,6], although trials to date have failed to show an impact of HSV medication on HIV acquisition [1-3]. The impact of HSV-1 on HIV is less researched, possibly as it causes genital herpes with less severe symptoms and less frequent recurrences [7] and because it is primarily acquired orally early on in childhood in most countries with a high HIV incidence [7,8]. However, 50% of diagnoses of first attacks of ano-genital herpes amongst MSM in the United Kingdom (UK) are now caused by HSV-1 [5,7,9,10].

The prevalence of HSV type 2 and 1 varies widely between and within countries [8,11]. In the UK as elsewhere in Western Europe, there are high rates of sexually transmitted infections (STI) (other than HSV) amongst MSM, particularly HIV-positive MSM [12,13], and there have been increasing diagnoses of anogenital herpes reported by sexual health clinics [9]. However, information on the prevalence of HSV amongst HIV-positive and HIV-negative MSM in the UK is not available: the infection is primarily asymptomatic or unrecognised and serological screening is not routinely performed [3,5]. Furthermore, mandatory reports from STI clinics do not currently include the HIV status of the person diagnosed. Previous prevalence surveys in the UK included small numbers of MSM [14] or combined HIV-positive and HIV-negative MSM [15]. This study was carried out to measure the seroprevalence of HSV amongst HIV-positive and HIV-negative MSM in England and Wales to inform our understanding of the role of HSV in the HIV epidemic amongst MSM in the UK and the potential of HSV interventions to contribute to HIV prevention and management in this context.

Methods

Samples were drawn from the National Unlinked Anonymous Survey of Genito-Urinary Medicine Clinic Attendees (GUM Anon) [16] serum archive, which includes unlinked anonymous

residual blood specimens collected for routine syphilis serology at representative sentinel sexual health clinics across England and Wales. For each serum limited information was available, including prevention group, prior knowledge of HIV status and diagnoses received at the visit. All specimens were screened for anti-HIV-1/-2 antibodies using an immunometric ('third generation') enzyme immunoassay (Murex HIV-1.2.0 EIA (GE95), Abbott Diagnostics) [17]; reactive specimens were further examined to establish their true HIV status by a 2nd generation indirect EIA based on oligopeptide antigens (Clonesystems HIV-1/HIV-2 EIA (851403), BioChem ImmunoSystems Inc)[17] and by an in-house IgG class-specific capture assay which distinguishes HIV-1 from HIV-2 infection (GACPAT HIV 1+2) [18]. Specimens whose HIV status was still ambiguous were also examined by Western Blot. Sera from individuals with a previously undiagnosed HIV infection were further examined by the Serological Testing Algorithm for Recent HIV Seroconversion (STARHS) using the 'detuned' Vironostika HIV-1 microelisa test (bioMérieux). The mean time since seroconversion for sera testing positive for recently acquired HIV infection by the detuned test is six months [19].

The study included a randomised age-stratified sample of 3,968 specimens from a total of 8,463 specimens obtained from MSM attending twelve sentinel sexual health clinics (seven in London and five elsewhere across England and Wales) during 2003. All sera were tested for HSV-2 and HSV-1 antibodies using a pair of enzyme immunoassays that distinguish the type-specific antibody response against HSV-2 and HSV-1 [20]. They utilise type-specific murine monoclonal antibodies whose binding to the homologous HSV antigen is blocked when the specimen under test also contains the homologous antibody type. Specimens that inhibit the binding of the monoclonal antibody by ≥50% are considered to be positive for that HSV type-specific antibody. The performance of these assays has been established and validated against independent typing methods [21,22].

Point prevalence estimates of HSV-2 and HSV-1 serostatus were calculated. These were weighted to adjust for age-group stratification. Associations of HSV serostatus with HIV infection and other risk factors were analysed using prevalence risk ratios (RR) at the univariate and multivariate level, through applying

Table 1

Seroprevalence of herpes simplex virus type 2 (HSV-2) and prevalence risk ratios amongst men who have sex with men (MSM) attending sentinel sexual health clinics in England and Wales, by selected clinical and demographic characteristics, 2003

	n	HSV-2 seroprevalence# (95% CI)	Univariate risk ratio (95% CI)	Multivariate risk ratio** (95% CI)
Unlinked anonymous HIV serostatus				
HIV-seronegative	3,363	17% (CI: 15%-18%)	1	1
HIV-seropositive	605	55% (CI: 51%-59%)	3.29 (2.94-3.68)*	2.14 (1.92-2.37)*
World region of birth				
United Kingdom	2,416	18% (CI: 16%-19%)	1	1
Other European country or United States	477	31% (CI: 27%-35%)	1.75 (1.48-2.08)*	1.27 (1.08-1.49)*
Caribbean	31	46% (CI: 28%-64%)	2.59 (1.69-3.95)*	1.94 (1.33-2.84)*
Sub-Saharan Africa	102	17% (CI: 10%-26%)	0.94 (0.59-1.51)	0.79 (0.52-1.21)
Central and South America	115	43% (CI: 34%-53%)	2.44 (1.92-3.11)*	1.93 (1.55-2.39)*
Elsewhere	206	16% (CI: 11%-21%)	0.89 (0.64-1.24)	0.97 (0.74-1.27)
Not recorded	621	34% (CI: 30%-38%)	1.93 (1.67-2.24)*	1.13 (1.00-1.29)
Age-group (in years)				
<25	1,283	7% (CI: 5%-8%)	1	1
25-34	889	18% (CI: 16%-21%)	2.71 (2.12-3.47)*	1.92 (1.560-2.45)*
35-44	895	33% (CI: 30%-36%)	4.98 (3.99-6.23)*	3.24 (2.59-4.07)*
>=45	901	42% (CI: 40%-46%)	6.41 (5.16-7.96)*	4.55 (3.65-5.68)*
Clinic location				
Outside London	1,304	10% (CI: 9%-12%)	1	1
London	2,664	28% (CI: 26%-30%)	2.75 (2.28-3.31)*	1.71 (1.43-2.05)*
Unlinked anonymous HSV-1 serostatus				
HSV-1-seronegative	1,159	17% (CI: 15%-20%)	1	1
HSV-1-seropositive	2,809	25% (CI: 23%-27%)	1.46 (1.26-1.71)*	1.00 (0.88-1.14)
Diagnosis of acute STI at clinic visit $				
No	2,620	24% (CI: 22%-26%)	1	1
Yes	1,348	20% (CI: 18%-23%)	0.84 (0.74-0.96)*	1.04 (0.93-1.16)
Total	**3,968**	**23% (CI: 21%-24%)**	**n/a**	**n/a**

Weighted to adjust for age-group stratification in the sampling
*Chi-squared test shows this to be a statistically significant difference at the 95% level
**All risk factors included in multivariate analysis
$ Acute sexually transmitted infection (STI) defined as presenting at the clinic visit with one of the following: infectious syphilis, gonorrhoea, chlamydia, non-specific urethritis (NSU), trichomoniasis, scabies/pediculosis, human papillomavirus (HPV) first attack or molluscum contagiosum. Excludes ano-genital herpes diagnoses.

a modified Poisson Regression method [23]. Risk ratios were used rather than odds ratios, as the seroprevalence of HSV was high. Among HIV-positive individuals, the association of HSV-2 and HSV-1 serostatus with knowledge of HIV serostatus, recently acquired HIV infection (derived through STARHS) and other characteristics was investigated. HSV-2 and HSV-1 serostatus was also determined for individuals who received diagnoses of clinical first attack and recurrent genital herpes at the visit. All confidence intervals (CI) were calculated at the 95% level. STATA 10 was used for analysis.

The legal and ethical basis for unlinked anonymous HIV testing was established before the programme began and is consistent with the Human Tissue Act 2004 and other guidelines [24]. Approval was received from local ethics committees covering each site where the GUM Anon survey was underway. Approval for HSV testing was also given by a Multi-Centre Research Ethics Committee (REC: 05/MRE02/4).

Results

The study population

Sixteen percent (CI: 15%-17%) of the study population were HIV-positive according to unlinked anonymous HIV antibody testing. Of these 83% (CI: 80%-86%) already knew their status on attending the clinic, 8% (CI: 6%-11%) were diagnosed at the visit and 9% (CI: 6%-11%) remained undiagnosed on leaving the clinic. Overall, 59% (CI: 57%-60%) of the study population were UK-born, 59% were under the age of 35 years, and 70% (CI: 69%-71%) attended a clinic in London. Forty-seven individuals (1%, CI: 1%-2%) received an ano-genital herpes diagnosis at

Table 2

Seroprevalence of herpes simplex virus type 2 (HSV-2) amongst HIV-positive and HIV-negative men who have sex with men (MSM) attending sentinel sexual health clinics in England and Wales, by world region of birth and age-group, 2003

	HIV-positive MSM		HIV-negative MSM	
	n	HSV-2 prevalence# (95% CI)	N	HSV-2 prevalence# (95% CI)
World region of birth				
United Kingdom	257	52% (CI: 45%-58%)	2,159	13% (CI: 12%-15%)
Other European country or United States	104	57% (CI: 47%-66%)	373	23% (CI: 19%-28%)
Caribbean	8	82% (CI: 47%-96%)	23	33% (CI: 16%-56%)
Sub-Saharan Africa	21	28% (CI: 12%-51%)	81	14% (CI: 7%-24%)
Central and South America	23	79% (CI: 56%-92%)	92	33% (CI: 24%-44%)
Elsewhere	23	38% (CI: 20%-59%)	183	13% (CI: 9%-18%)
Not known	160	60% (CI: 52%-68%)	461	25% (CI: 21%-30%)
Age group (in years)				
<25	47	28% (CI: 17%-43%)	1,236	6% (CI: 5%-7%)
25-34	138	39% (CI: 32%-48%)	751	14% (CI: 12%-17%)
35-44	217	65% (CI: 58%-71%)	678	23% (CI: 20%-27%)
>=45	194	70% (CI: 64%-76%)	707	35% (CI: 32%-39%)

Weighted to adjust for age-group stratification in the sampling

Table 3

Seroprevalence of herpes simplex virus type 2 (HSV-2) amongst men who have sex with men (MSM) attending sentinel sexual health clinics in England and Wales, 2003, by knowledge of HIV status and recently acquired HIV infection

	n	HSV-2 seroprevalence (95% CI)#	Univariate risk ratio (95% CI)	Multivariate risk ratio** (95% CI)
Knowledge of HIV status				
HIV-negative	3,363	17% (CI: 15%-18%)	1	1
Diagnosed HIV-positive at the visit	46	49% (CI: 34%-63%)	2.91 (CI: 2.11-4.02)*	2.57 (CI: 1.92-3.43)*
Remained undiagnosed HIV-positive after visit	46	52% (CI: 37%-66%)	3.12 (CI: 2.31-4.22)*	2.45 (CI: 1.86-3.23)*
Diagnosed HIV-positive before visit	513	56% (CI: 51%-60%)	3.34 (CI: 2.98-3.76)*	2.08 (CI: 1.87-2.32)*
Recently acquired HIV infection (determined through STARHS)^				
HIV-negative	3,363	17% (CI: 15%-18%)		
Recently acquired HIV infection	20	39% (CI: 20%-62%)	2.34(CI: 1.31-4.18)*	1.95 (CI: 1.16-3.28)*
Non-recently acquired HIV infection	62	53% (CI: 41%-66%)	3.2 (CI: 2.49-4.15)*	2.61 (CI: 2.06-3.32)*

* Chi-squared test shows this to be a statistically significant difference at the 95% level
** Multivariate analysis is adjusted by world region of birth, age-group, clinic location, HSV-1 serostatus diagnosis with acute STI
^ derived through the Serological Testing Algorithm for Recent HIV Seroconversion (STARHS) which was applied to all 'previously undiagnosed' HIV positive sera. The mean time since seroconversion for those testing positive for recently acquired HIV infection is six months. and diagnosis with acute STI

the visit, including 12 (24% (CI: 13%-39%) that were recurrent infections. Thirty-four percent of the study population (CI: 33%-36%) received a diagnosis with another 'acute STI' diagnosis at the visit (infectious syphilis, gonorrhoea, chlamydia, non-specific urethritis (NSU), trichomoniasis, scabies/pediculosis, human papilloma virus (HPV) first attack or molluscum contagiosum). Of the 92 sera with a previously undiagnosed HIV infection 82 had STARHS results available. Of these, 23% (CI: 15%-33%) were classified as a 'recent' infection.

HSV-2 seroprevalence amongst HIV-positive and HIV-negative MSM

Of HIV-positive men, 55% (CI: 51%-59%) were HSV-2-seropositive, compared to 17% (CI: 15%-18%) of HIV-negative men. The unadjusted risk ratio for HSV-2 infection was 3.29 (CI: 2.94-3.68, p<0.001), over three-fold higher amongst HIV-positive men than HIV-negative men, and this association remained highly significant in multivariate analysis (RR=2.14 [CI: 1.92-2.37], p<0.001) (Table 1).

HSV-2 seroprevalence was higher amongst men born outside the UK (28% [CI: 25%-31%], vs 18% [CI: 16%-19%]), even after adjusting for HIV status and other cofactors (adj RR 1.25 [CI: 1.09-1.42]. The prevalence of HSV-2 was particularly high amongst those born in the Caribbean and in Central and South America. There was no statistical difference in HSV-2 seroprevalence between men born in sub-Saharan Africa and those born in the UK, even after adjusting for other variables, p=0.285). HSV-2 seroprevalence increased with age-group (Table 1). These trends were similar for HIV-positive and HIV-negative MSM (Table 2).

Amongst HIV-positive men, there was no statistical evidence for a difference in HSV-2 seroprevalence between those diagnosed with HIV prior to the sexual health clinic attendance, those diagnosed at the visit and those that remained undiagnosed. Prevalence in each of these sub-groups of HIV-positive men was more than two-fold higher than the 17% prevalence (CI: 15%-18%) found amongst HIVnegative men (Table 3).

Table 4

Seroprevalence of herpes simplex virus type 1 (HSV-1) and prevalence risk ratios amongst men who have sex with men (MSM) attending sentinel sexual health clinics in England and Wales, by selected clinical and demographic characteristics, 2003

	n	Seroprevalence (95% CI) #	Univariate risk ratio (95% CI)	Multivariate risk ratio** (95% CI)
Unlinked anonymous HIV serostatus				
HIV-seronegative	3372	69% (67%-71%)	1	1
HIV-seropositive	596	88% (85%-90%)	1.27 (1.22-1.33)*	1.19 (1.14-1.24)*
World region of birth				
United Kingdom	2,416	68% (66%-70%)	1	1
Other European country or United States	477	77% (73%-81%)	1.14 (1.08-1.21)*	1.09 (1.03-1.16)*
Caribbean	31	81% (61%-92%)	1.21 (1.01-1.44)*	1.22 (1.03-1.45)*
Sub-Saharan Africa	102	79% (70%-89%)	1.20 (1.09-1.33)*	1.19 (1.07-1.32)*
Central and South America	115	89% (81%-93%)	1.33 (1.24-1.43)*	1.30 (1.20-1.41)*
Elsewhere	206	71% (64%-77%)	1.03 (0.94-1.14)	1.03 (0.93-1.13)
Not recorded	621	79% (75%-82%)	1.17 (1.11-1.23)*	1.05 (1.00-1.11)
Age-group (in years)				
<25	1283	56% (53%-59%)	1	1
25-34	889	74% (71%-77%)	1.32 (1.24-1.40)*	1.25 (1.18-1.34)*
35-44	895	81% (78%-83%)	1.44 (1.36-1.52)*	1.37 (1.29-1.46)*
>=45	901	78% (75%-81%)	1.39 (1.31-1.48)*	1.35 (1.27-1.44)*
Clinic location				
Outside London	1304	66% (63%-69%)		
London	2664	75% (73%-76%)	1.13 (1.08-1.19)	0.99 (0.94-1.04)
Unlinked anonymous HSV-2 serostatus				
No	3,034	70% (68%-72%)	1	1
Yes	934	79% (76%-82%)	1.13 (1.08-1.17)*	0.98 (0.94-1.03)*
Diagnosis of STI at clinic visit $				
No	2620	71% (69%-73%)	1	1
Yes	1348	74% (71%-76%)	1.04 (0.99-1.08)	1.06 (1.02-1.11)*
Total	**3,968**	**72% (70%-74%)**	**n/a**	**n/a**

Weighted to adjust for age-group stratification in the sampling
*Chi-squared test shows this to be a statistically significant difference at the 95% level
**All risk factors included in multivariate analysis
$ Acute STI defined as presenting at the clinic visit with one of the following diagnoses: infectious syphilis, gonorrhoea, chlamydia, non-specific urethritis (NSU), trichomoniasis, scabies/pediculosis and human papillomavirus (HPV) first attack or molluscum contagiosum. Excludes ano-genital herpes diagnoses.

Similarly, there was also no statistical evidence for a difference in HSV-2 seroprevalence between MSM with recently acquired HIV infection and those with 'non-recent' HIV infection (p-value=0.269). Both groups had a higher seroprevalence of HSV-2 than HIV-negative men.

HSV-1 seroprevalence

Overall, seven in 10 men were HSV-1 seropositive. As with HSV-2, HSV-1 seroprevalence was higher amongst HIV-positive men (88% [CI: 85%-90%]) than HIV-negative men (69% [CI: 67%-71%]), although the risk ratio was smaller than for HSV-2 (Adj RR: 1.19 [CI: 1.14-1.24]) (Table 4). As with HSV-2, the seroprevalence of HSV-1 increased with age, although it was much higher in the youngest age-group than the seroprevalence of HSV-2 (56% [CI: 53%-59%]) vs 7% [CI: 5%-8%]).

There were 47 (1%, CI: 1%-2%) episodes of ano-genital herpes diagnosed clinically among the 3,968 attendees. Of the 35 diagnoses of first attack ano-genital herpes, 15 (43%) were HSV-1 seropositive and HSV-2 seronegative at the time of clinical diagnosis. The same was true for four (33%) of the 12 diagnoses with recurrent ano-genital herpes (Figure).

Discussion

To our knowledge this is the first published study of the seroprevalence of HSV-2 and HSV-1 amongst MSM in the UK where it has been possible to differentiate between HIV-positive and HIV-negative MSM. More than one in two HIV-positive MSM and nearly one in six HIV-negative MSM attending sexual health clinics in 2003 were HSV-2-seropositive. This is of concern, given the increasing evidence for the role of HSV-2 in HIV progression, onward transmission and acquisition [1-3]. The prevalence rates may be an underestimate of current rates amongst MSM attending sexual health clinics, as the annual number of ano-genital herpes diagnoses in sexual health clinics and the prevalence of HIV and other STI have increased since 2003 [9]. It should be borne in mind that in general prevalence rates of STI amongst MSM attending sexual health services are likely to be higher than amongst other MSM.

The prevalence of HSV-2 in this study is similar or lower than those found amongst HIV-positive and HIV-negative MSM in studies elsewhere in Europe, the Americas and Australia [8]. This is consistent with the global epidemiology: whilst there is considerable variation in HSV-2 prevalence worldwide, in general, HSV-2 prevalence is lower in Europe than in Africa and the Americas [8,11]. In our study, the prevalence of HSV-2 amongst MSM born in sub-Saharan Africa was not different to that amongst UK-born MSM, even after adjusting for age and other factors. Additional information such as ethnicity and sexual behaviour would be needed to understand how MSM born in sub-Saharan Africa attending sexual health clinics in England and Wales differ from the overall population in their region of birth. As would be expected, the prevalence of HSV-2 increased with age [8,15]. Whether or not the men knew their HIV status and whether or not they had been recently infected with HIV made little difference to the prevalence of HSV-2 amongst HIV-positive MSM. It was not possible with this study design to identify whether the HSV-2 infection took place before, after or concurrently with the HIV infection.

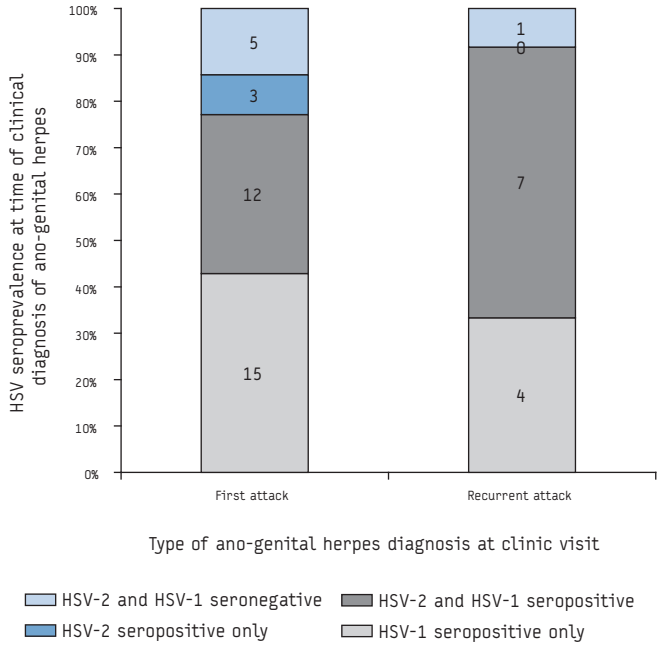
This study also showed that seven in 10 MSM were HSV-1-positive, a rate similar to that found in other high-risk groups in Europe [8]. As with HSV-2, the prevalence was disproportionately high amongst HIV-positive MSM and this association remained significant at the multivariate level. In our study, almost one in two men diagnosed clinically with a first attack of ano-genital herpes and one in three men diagnosed with a recurrent attack of ano-genital herpes had only HSV-1 antibodies at the time of the clinical diagnosis. Unfortunately, no culture or PCR result was available from the genital ulcers to determine the type causing the presenting ano-genital disease. Most of those diagnosed with a first attack of ano-genital herpes who were HSV-1 seropositive only may have been infected with HSV-2 as well but had not yet seroconverted. However, the high proportion of those with a clinical diagnosis of a recurrent attack who were HSV-1 seropositive only is in line with existing data showing that HSV-1 is increasingly acquired genitally in many developed countries. HSV-1 now accounts for approximately half of first episodes of ano-genital herpes amongst MSM in the UK [5,7]. Given this and the association between HSV-1 serostatus and HIV, more research is merited on the role of HSV-1 in the HIV epidemic among MSM in England and Wales.

Implications for HIV prevention and management

Despite several trials demonstrating that HSV antivirals can reduce HIV viral load and viral shedding [25,27], no trials to date have demonstrated the efficacy of HSV antivirals in reducing HIV onward transmission [1,2,4]. Similarly, despite trials showing that HSV-2-seropositive individuals are more than twice as likely to acquire HIV, no trials have demonstrated that antivirals can reduce HIV acquisition [1-3]. Research is ongoing as to whether different antivirals, or an HSV vaccine or other interventions, may yet prove to be successful at using HSV control for HIV prevention (2).

Figure

Herpes simplex virus type 2 and 1 (HSV-2 and HSV-1) serostatus of patients at time of receiving clinical diagnosis of ano-genital herpes, men who have sex with men (MSM) attending sentinel sexual health clinics in England and Wales, 2003 (n=47)



Note: No data from culture or PCR from the genital area was available

Results have been more promising in terms of HSV control in the context of HIV management. The recent Partners in Prevention trial showed that HSV antivirals significantly slowed the rate of HIV progression to a CD4 cells count <200 mm3, need for antiviral treatment and death amongst dually infected African men and women [4]. This is supported by pre-HAART trials showing that HSV antivirals offered a significant survival benefit for HIV-positive individuals [28]. Currently, clinics in England and Wales do not routinely carry out asymptomatic serological screening for HSV amongst HIV-positive MSM, although they do administer antivirals to symptomatic herpes patients [1]. While the UK context is very different to many African countries, these recent PIP trial results together with the high prevalence of HSV-2 amongst HIV-positive MSM in England and Wales suggest a review of HSV control in the management of HIV amongst MSM is warranted.

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Syphilis and gonorrhoea in men who have sex with men: a European overview

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This paper describes recent trends in the epidemiology of syphilis and gonorrhoea infections in Europe among men who have sex with men (MSM). Routine surveillance data submitted to the European Surveillance of Sexually Transmitted Infections (ESSTI) network from 24 European countries for the period 1998-2007 were analysed. Data on whether syphilis and gonorrhoea infections were in MSM were available for 12 and 10 countries respectively. The number of syphilis cases reported to be MSM increased considerably in all Western European countries. While in some Central and Eastern European countries the male to female ratio remained relatively stable at around 1:1, in Slovenia and the Czech Republic the proportion of male cases increased and so did the percentage of cases reported to be MSM. More cases of gonorrhoea were seen in men than women, but the percentage of male cases reported to be MSM was lower than for syphilis. The findings suggest MSM are at high risk of STI in Western Europe and appear to be an increasingly important risk group in Central Europe. Despite this, data on infections among MSM are not collected routinely in many countries. The introduction of standardised data collection including data on diagnoses in MSM should be prioritised for monitoring STI in this population.

Introduction

Sexually transmitted infections (STI) are a major public health problem in Europe. During the 1980s a reduction in the incidence of STI was seen in many countries likely due to behavioural change occurring in response to the emergence of HIV/AIDS [1]. In recent years an increase in the number of STI in men who have sex with men (MSM) has been reported in a number of industrialised countries [2,3] and has coincided with several reported outbreaks of syphilis and lymphogranuloma venererum (LGV) infection among the MSM population [4-10].

The collection of European surveillance data on HIV and AIDS through EuroHIV has been in place since 1984 with standardised definitions for "route of transmission" data including whether the infection was acquired through homosexual or heterosexual sex. The European Surveillance of Sexually Transmitted Infections (ESSTI) network was first established in 2001 and is a collaboration of STI epidemiologists and microbiologists from 24 European countries (http://www.essti.org/). One of the key objectives of ESSTI is to collate and analyse surveillance data on acute STI in order to inform public health policy and control of STI. While surveillance data on STI had been collected at the European level for some time by both the World Health Organization (WHO) and, more recently, the European Centre for Disease Prevention and Control (ECDC), until recently data on diagnoses in MSM had not been routinely collected. ESSTI has prioritised the development of minimum standards for collecting and disseminating STI surveillance data [11]. New and historic data on diagnoses in MSM have been collected by the network since 2006.

In this paper we analysed ESSTI data to provide an insight into the recent epidemiology of syphilis and gonorrhoea among MSM across Europe and to discuss its public health implications. We also reviewed the potential difficulties of collecting this kind of information at the European level.

Methods

Twenty-three ESSTI participating countries and the Czech Republic were asked to provide, where possible, aggregated data on syphilis and gonorrhoea diagnoses by gender between 1998 and 2007. Data on sexual orientation, whether the infection was homosexually acquired, gender of partner, and probable route of transmission were used to determine infections in MSM, according to the reporting system of each country (Table 1). As some countries either could not provide data specifically for MSM or had only recently started collecting this information, trends in gender ratios were also investigated as a proxy marker for changes in the epidemiology in MSM. Male to female ratios were calculated for all countries that provided gender data.

Data were collected on the stage of syphilis infection and, wherever possible, the analyses presented here used diagnoses of infectious syphilis (definitions in footnote of Table 2). Data on site of infection and diagnostic methods used were not routinely available from all countries and were not collected although the majority of countries in the ESSTI network are known to carry out culture for gonorrhoea [12].

Countries reported data on diagnoses collected through 'universal' or 'sentinel' surveillance systems. Universal systems collect data from all laboratories or the relevant clinical services whereas sentinel systems collect data from only a sample of these (although often with more detailed risk factor information). Countries which had more than one surveillance system in place for a particular infection provided data from their universal systems. From countries that had made significant changes to their

surveillance systems during the study period, data were collected only from the most recent system.

For the purposes of all ESSTI analyses Cyprus, the Czech Republic, Slovakia, Slovenia and Turkey were classified as Central European countries. Estonia and Latvia were classified as Eastern European and all other participating countries as Western European.

Results

Twenty-four countries submitted surveillance data on syphilis and/or gonorrhoea to ESSTI. These data, available in full in the annual report produced by ESSTI [13], were used to describe the overall trends in syphilis and gonorrhoea infection in Europe. Ten and 12 countries were able to provide data on gonorrhoea and syphilis infections in MSM, respectively (Table 1). The type of surveillance system i.e. universal or sentinel, the availability of syphilis stage of infection and the period for which data were available, varied between countries (Table 1).

Syphilis

Western Europe

The overall number of reported syphilis cases increased substantially in most Western European (WE) countries between 1998 and 2007, mostly among men, although there was a slight

Table 1

Characteristics of gonorrhoea and syphilis surveillance data available in Europe for 1998-2007

Country	Surveillance system	Variables collected				Note
		Total numbers	Gender	Data on men who have sex with men (MSM)	Year from which MSM data available	
Western Europe						
Austria	Universal	✓	-	-		
Belgium	Sentinel	✓	✓	SO	2005	
Denmark	Universal	✓	✓	SO	1998	
Finland	Universal	✓	✓	-		
France	Sentinel	✓	✓	SO	2000	SO data only available for syphilis
Germany	Universal	✓	✓	SO	2001	Syphilis only
Greece	Universal[a]	✓	✓	SO	2000	Gonorrhoea only
Iceland	Universal	✓	✓	-		
Ireland	Universal[b]	✓	✓	SO	1998	SO data only available for syphilis
Italy	Universal	✓	✓	-		
Malta	Universal	✓	✓	-		
Netherlands	Sentinel	✓	✓	SO	2003	
Norway	Universal	✓	✓	SO	1998	
Portugal	Universal	✓	✓	-		
Spain	Universal	✓	-	-		
Sweden	Universal	✓	✓	PRT	1998	
United Kingdom	Universal[a]	✓	✓	HOMO	1998	
Central Europe						
Cyprus	Universal	✓	✓	PRT	2005	
Czech Republic	Universal	✓	✓	SO	1998	
Slovakia	Universal	✓	✓	-		
Slovenia	Universal	✓	✓	GP	2001	
Turkey	Universal	✓	✓	-		
Eastern Europe						
Estonia	Universal	✓	✓	-		
Latvia	Universal	✓	✓	-		

[a]Data from genitourinary medicine clinics (GUM)
[b]Enhanced surveillance system for syphilis
✓ Collected variable; - Variable not collected
SO = Sexual orientation
GP = Gender of partner
PRT = Probable route of transmission
HOMO = Homosexually acquired

Table 2

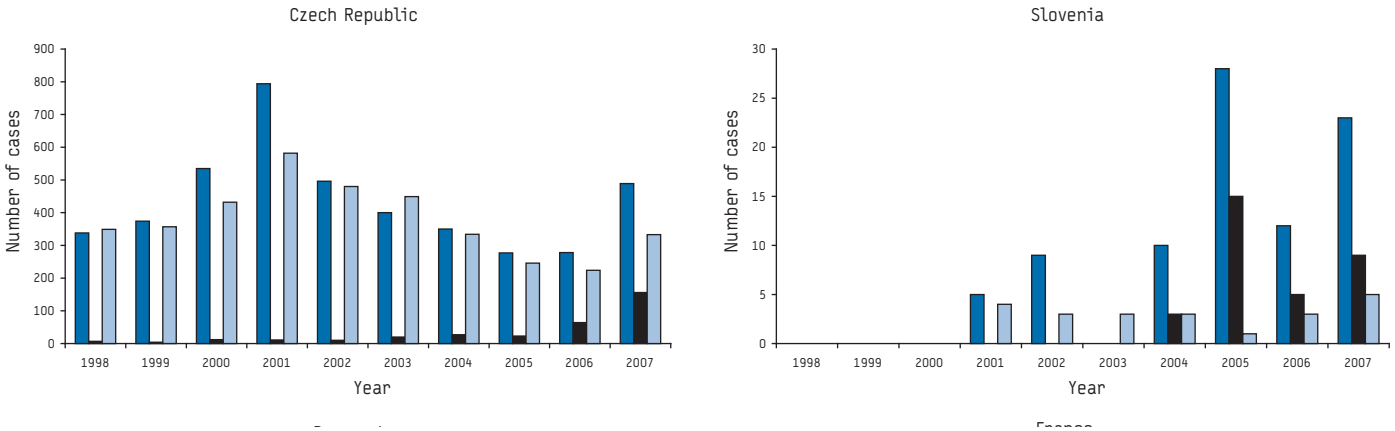
Male to female ratio of reported syphilis* and gonorrhoea cases, and the percentage of male cases in men who have sex with men (MSM), in Europe 1998-2007**

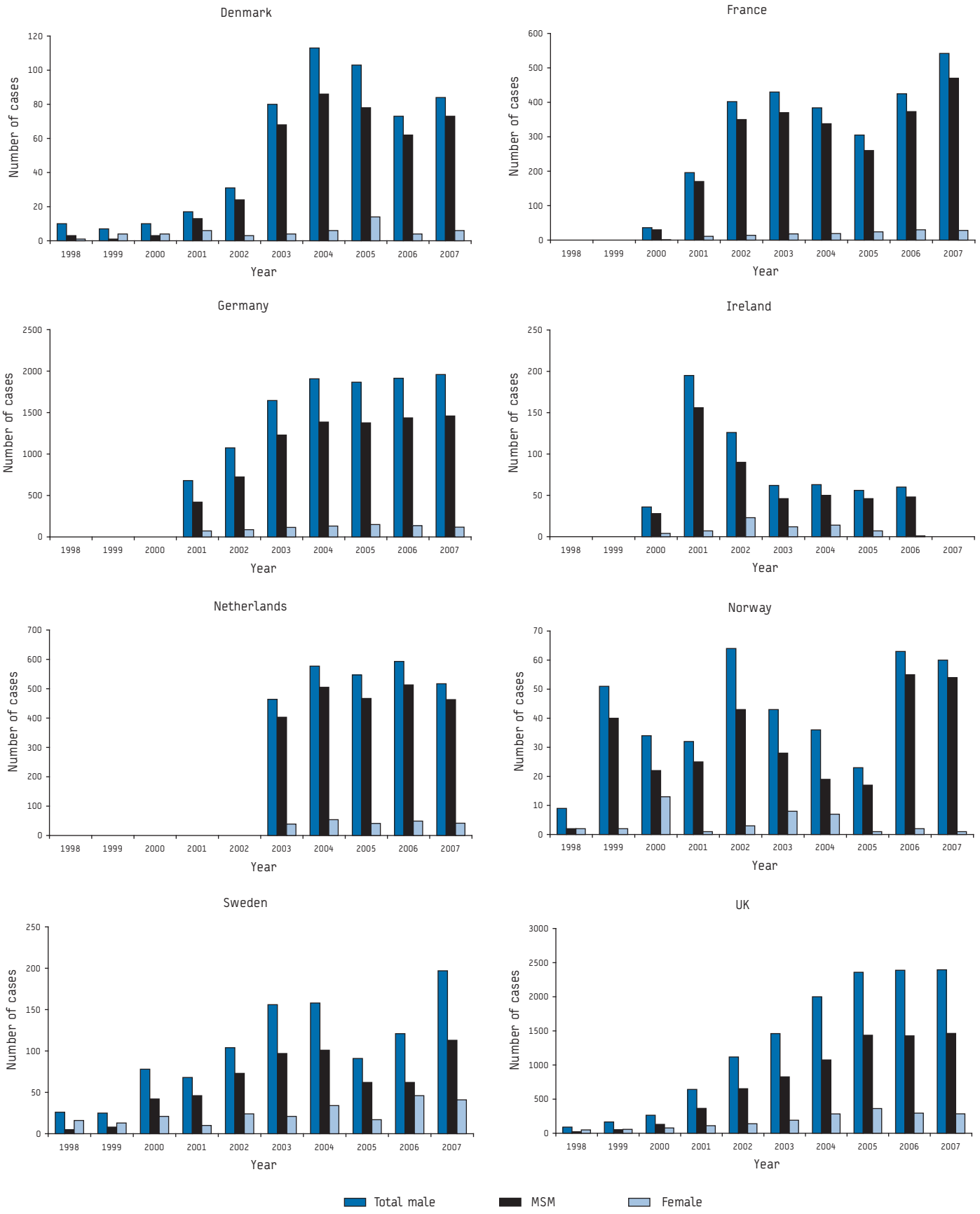
Country	Syphilis						Gonorrhoea					
	1998		2003		2007		1998		2003		2007	
	Gender ratio	% MSM	Gender ratio	% MSM	Gender ratio	% MSM	Gender ratio	% MSM	Gender ratio	% MSM	Gender ratio	% MSM
Western Europe												
Belgium	-	-	9.7	-	7.3	87	2.5	-	4.3	-	2.9	65
Denmark	10.0	30	20.0	85	14.0	87	10.6	61	8.3	42	4.7	44
Finland	1.2	-	1.1	-	1.9	-	3.0	-	5.5	-	4.5	-
France	-	-	23.9	86	19.4	87	-	-	7.1	-	5.5	-
Germany	-	-	14.3	75	16.6	75	-	-	-	-	-	-
Greece	-	-	-	-	-	-	23.4	14	28.8	31	66.0	19
Iceland****	-	-	1.0	-	1.0	-	2.0	-	na***	-	2.1	-
Ireland****	-	-	5.2	74	60.0	80	3.2	-	3.8	-	7.9	-
Italy	3.0	-	5.3	-	3.7	-	11.6	-	20.9	-	12.4	-
Malta	-	-	-	-	2.0	-	-	-	-	-	4.3	-
Netherlands	-	-	11.9	87	12.3	90	-	-	4.4	61	3.3	69
Norway	4.5	29	5.4	65	60.0	90	5.9	30	5.9	35	6.9	37
Portugal	1.0	-	1.6	-	2.2	-	9.0	-	4.9	-	7.2	-
Sweden	1.6	19	7.4	62	4.8	57	4.7	26	4.1	46	4.1	38
UK	1.8	26	7.6	57	8.4	61	2.1	20	2.3	23	2.2	30
Central Europe												
Cyprus	3.1	-	2.0	-	2.3	0	7.4	-	8.3	-	4.0	0
Czech Republic	1.0	2	0.9	5	1.5	32	1.4	5	2.0	13	2.4	26
Slovakia	1.1	-	0.9	-	1.0	-	3.7	-	3.9	-	3.4	-
Slovenia	1.6	-	0.0	0	4.6	39	7.7	-	6.0	19	8.8	69
Turkey	-	-	1.3	-	1.1	-	0.0	-	0.0	-	0.2	-
Eastern Europe												
Estonia	1.0	-	0.4	-	0.5	-	1.4	-	1.1	-	0.6	-
Latvia	1.0	-	1.1	-	1.0	-	2.5	-	3.3	-	3.6	-

* Infectious syphilis data available as follows: primary and secondary syphilis: Italy, UK; primary, secondary and early latent: Belgium, Czech Republic, Denmark, France, Germany, Greece, Iceland, Ireland, Portugal, Slovenia; primary, secondary and latent: Cyprus, Malta, Netherlands, Norway, Sweden. All other countries only collected data on all stages combined.
**Austria and Spain excluded from table as gender is not collected
***All male
****2006 data

Figure 1

Number of syphilis cases reported from various Central and Western European countries, in all men, men who have sex with men (MSM), and women, 1998-2007*

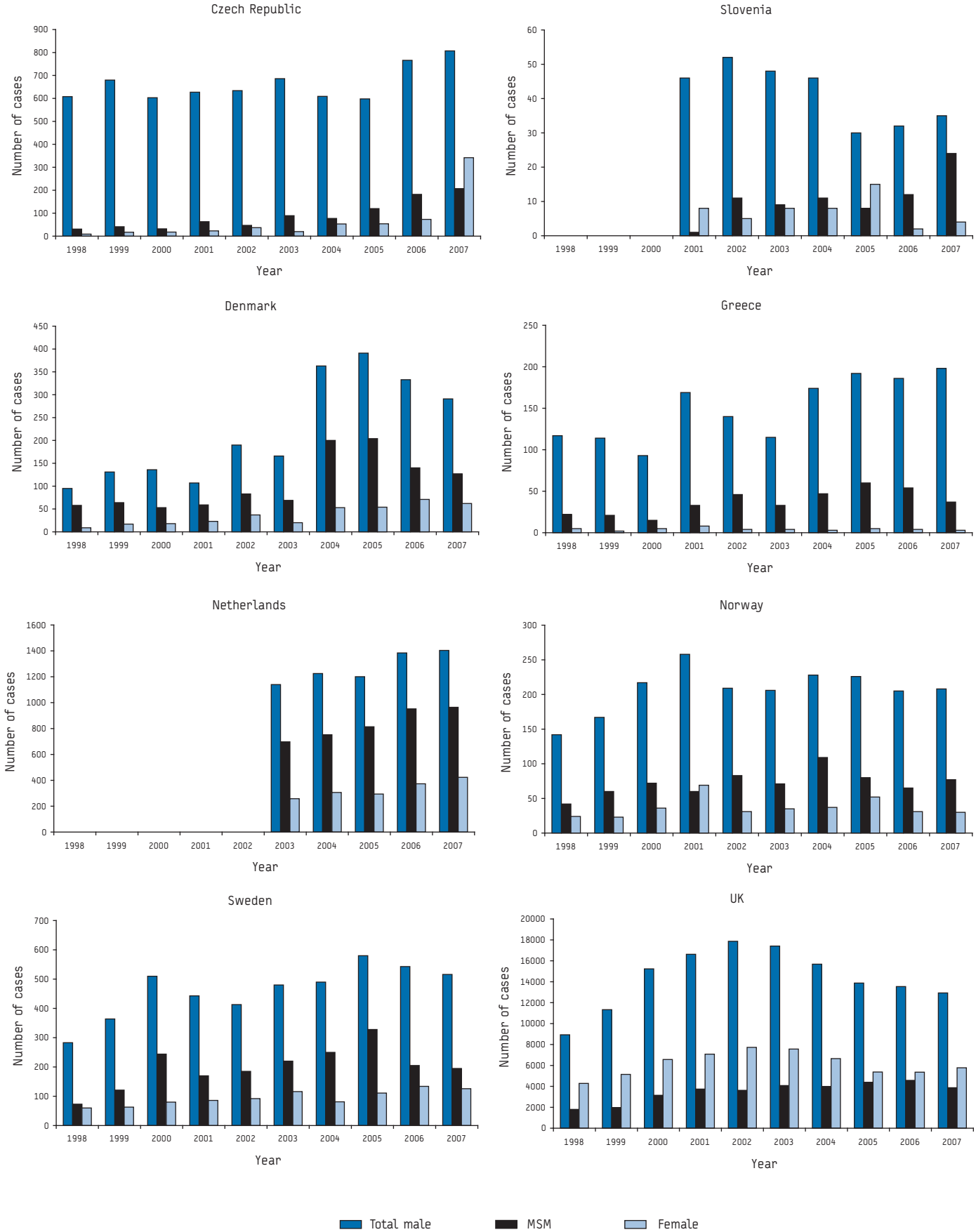




*Includes only countries with complete data from 2003 onwards
Note different scales

FIGURE 2

Number of gonorrhoea cases reported from various Central and Western European countries, in all men, men who have sex with men (MSM), and women, 1998-2007*



*Includes only countries with complete data from 2003 onwards
Note different scales

downturn in overall numbers in many countries from the early to mid-2000s (Figure 1) [13]. In 1998, in four out of seven WE countries reporting these data, the male to female ratio was below 2:1. By 2007, with the exception of Finland and Iceland, in all WE countries reporting these data the male:female ratio was above 2:1, with half of WE countries reporting a male:female ratio of 5:1 or greater (Table 2).

Consistent historic data for MSM dating back to 1998 were only available for four WE countries: Denmark, Norway, Sweden and the United Kingdom (UK). All four countries reported an increase in the number of syphilis cases reported among MSM since the late 1990s (Figure 1). Between 1998 and 2007, the number of male cases reported to be MSM rose 64-fold from 23 to 1,463 in the UK, from 3 to 73 in Denmark, and from 5 to 113 in Sweden. Over the same period, the percentage of male cases reported to be MSM also rose, from 30% to 87% in Denmark, from 19% to 57% in Sweden, from 26% to 61% in the UK and from 29% to 90% in Norway (Table 2). The countries with only more recent data available also showed similar increases in the number and proportion of cases among MSM (Figure 1).

Central and Eastern Europe

In contrast to WE countries, in Central and Eastern Europe between 1998 and 2007 there was a general decline in the number of reported syphilis cases. During the same period the sex ratio was relatively stable at around 1:1, with the exception of Slovenia where the male:female ratio rose to almost 5:1 in 2007. Only the Czech Republic among Central and Eastern European countries has collected data on diagnoses in MSM since 1998. In the Czech Republic the percentage of male cases reported to be MSM varied between 1% and 8% until 2005 but rose to 32% in 2007 (Figure 1; Table 2). In Slovenia in 2007, 39% of male cases were reported to be MSM (Figure 1; Table 2).

Gonorrhoea

Western Europe

The number of reported gonorrhoea cases in most WE countries rose between 1998 and 2007 with only Italy experiencing an overall decline [13]. In 2007, the male:female ratio of reported gonorrhoea cases ranged between 2:1 in Iceland and 66:1 in Greece (Table 2). Trends in the gender ratio over time were much more variable than for syphilis. Between 1998 and 2003, the male:female ratio rose in six WE countries (Belgium, Finland, Greece, Iceland, Italy and UK), fell in three (Denmark, Portugal and Sweden) and remained stable in Norway (Table 2). Between 2003 and 2007, the male:female ratio rose in four WE countries (Greece, Ireland, Norway and Portugal), fell in seven (Belgium, Denmark, Finland, France, Italy, the Netherlands, and UK) and remained stable in Sweden (Table 2). The percentage of male cases reported to be MSM rose slightly in four of the five WE countries with these data available from 1998: Greece, Norway, Sweden and UK, but fell in Denmark. However, over the same period the number of male cases reported to be MSM more than doubled in Denmark (58 to 127), Sweden (73 to 195) and in the UK (1799 to 3868) and also increased in Norway (42 to 77) (Figure 2). In 2007, the highest proportion of male cases reported to be MSM (69%) was in the Netherlands (Figure 2; Table 2).

Central and Eastern Europe

Between 1998 and 2007, the number of reported gonorrhoea cases in Central Europe remained fairly steady, while in Eastern Europe the rate fell considerably (by 89% and 46% in Estonia and Latvia respectively). There has been no clear pattern in the male:female ratio in Central and Eastern European countries since 1998, and in 2007 it ranged from 0.2:1 in Turkey to 9:1 in Slovenia. The percentage of male cases reported to be MSM rose from 5% to 26% in the Czech Republic between 1998 and 2007 and from 19% to 69% in Slovenia between 2003 and 2007 (Figure 2; Table 2). No cases of gonorrhoea in MSM were reported from Cyprus, and the overall number of gonorrhoea cases reported from Cyprus was small.

Discussion

Data from the ESSTI network indicate that MSM bear a disproportionate burden of syphilis and gonococcal infection across Western Europe and, in the case of syphilis, there is clear evidence that this has increased considerably. Patterns of diagnoses of these infections in Central and Eastern Europe are consistent with predominantly heterosexual transmission, although sex between men is becoming an increasingly important route of transmission in Slovenia and the Czech Republic.

In the early 1990s rates of syphilis infection in Western Europe were at historically low levels [14] but since then a large number of outbreaks affecting major urban centres in Europe have been reported [4,5,7,9,15-20]. The proportion of male cases reported to be MSM in these outbreaks ranged from 45% in Sweden [16] to 94% in Brighton, UK [18]. Reports of syphilis outbreaks have waned since 2003, possibly due to public health control measures [21]. However, syphilis remains a public health concern. While still rare, the number of cases seen annually in many countries is higher than before the outbreaks, suggesting syphilis is now endemic in the MSM population in parts of Western Europe.

Central and Eastern Europe experienced heterosexually acquired syphilis epidemics in the 1990s and total numbers of cases have been in decline since then [22]. However, although the overall numbers are low, ESSTI data indicate that syphilis transmission in MSM in Central and Eastern Europe is an emerging problem. Around a third of cases among men in the Czech Republic and two-fifths in Slovenia in 2007 were reported to be MSM.

Across Europe, more cases of gonorrhoea are seen in men than women. However, trends in numbers of diagnoses and the male:female ratio of reported cases may be poor markers of changes in infection burden among MSM over time. In some settings, gonococcal infections in women may be under-diagnosed because they tend to have fewer symptoms and due to the use of sub-optimal diagnostic methods which favour the definitive diagnosis of male gonococcal urethritis [23,24]. Similarly, screening for rectal and pharyngeal infections, which are often asymptomatic [25,26], is unlikely to be routine in many European countries, leading to under-diagnosis in MSM in particular. On the other hand, increasing use of highly sensitive nucleic acid amplification tests may have led to rising numbers of diagnoses being reported by many European countries. Despite these concerns, data from the ESSTI network suggest that, in 2007, MSM bore a disproportionate burden of gonococcal infection in many Western European and some Central and Eastern European countries.

The advent of HIV and AIDS in the 1980s heralded a change in sexual behaviour which was associated with subsequent falls in the number of STI diagnosed in the early 1990s [27,28]. The resurgence of syphilis and gonorrhoea among MSM in Western Europe coincided with the introduction of highly active antiretroviral therapies (HAART) and the resultant decrease in HIV-associated mortality [29]. The availability of HAART may have resulted in the

re-emergence of unsafe sexual behaviour among MSM [30,31], particularly among the core group which can maintain high levels of syphilis transmission. Increased transmission through oral sex, considered safer sex with respect to HIV risk, may also have contributed to rising diagnoses of these STI [4,5]. Furthermore, increasing use of the internet to select sexual partners with the same HIV status (serosorting) has likely led to more unprotected sex among HIV-positive men, contributing to high levels of STI and also HIV and STI co-infection [32]. In Western Europe, about 42% of syphilis cases in MSM were co-infected with HIV [33]. HIV co-infection has also been a feature of the ongoing lymphogranuloma venereum (LGV) epidemic in MSM [10].

Interpretation of trends in incident STI diagnoses across Europe has been hindered by the heterogeneity of surveillance systems, the lack of standardised case definitions, as well as different approaches to screening, testing and data collection [11].

Improvements in the reporting of homosexual behaviour over time, especially in Western Europe, may have contributed to rising diagnoses of STI among MSM presented here. At the same time underreporting of homosexual behaviour has also probably led to some underestimation of STI burden in MSM overall, particularly in Central and Eastern European countries where non-disclosure of sexual identity may be an issue [34].

The introduction of the new European Surveillance System (TESSy) at the European Centre for Disease Prevention and Control (ECDC) should help standardise and harmonise future data collection across Europe. The inclusion of data on diagnoses in MSM as part of this new standard may present challenges in some countries but will be crucial for informing STI control measures. The continuing transmission of STI in MSM is a major public health challenge facing Europe. Targeted control measures and improved monitoring of STI in this population need to be prioritised.

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Disproportionate and increasing burden of HIV infection among men who have sex with men in Slovenia: surveillance data for 1999-2008

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The report presents data on HIV infection among men who have sex with men (MSM) in Slovenia during 1999-2008. HIV surveillance was based on universal mandatory reporting of HIV/AIDS cases, monitoring HIV infection prevalence among sentinel populations of MSM and STI patients and selected behaviour indicators in a sentinel population of MSM. Among 48 newly diagnosed HIV cases reported for 2008, 34 were MSM. Since 1999, the annual reported rate of HIV diagnoses in MSM rose from 7.1 to 46.8 per million men aged 15-64 years (an increase of more than six times). During 1999-2008, the proportion of MSM diagnosed with AIDS within three months of HIV diagnosis declined from 60% to 21%, however, the corresponding rate per million men aged 15-64 increased from 4.3 to 9.6. During 1999-2008, HIV prevalence among male clients of STI outpatient services tested for syphilis (including a substantial proportion of MSM) increased from 0% to 3.4%, and it remained below 5% in a sentinel population of MSM in Ljubljana. In the same sentinel population of MSM, the proportion reporting HIV test last year increased from 29% in 2003 to 38% in 2008 while the proportion reporting condom use at last anal intercourse decreased from 81% in 2004 to 66% in 2008. The burden of HIV among MSM in Slovenia is disproportionately high and increasing fast. Promotion of safer sexual behaviour and HIV testing among MSM as well as positive prevention among MSM with diagnosed HIV infection are urgently needed.

Introduction

Human immunodeficiency virus (HIV) infection remains of major public health importance in Europe [1]. The predominant mode of transmission for HIV infection in European Union (EU) and European Free Trade Association (EFTA) countries appears to be sex between men [1]. The number of newly diagnosed HIV cases reported among men who have sex with men (MSM) has recently increased throughout EU and EFTA countries [1,2]. In 23 countries with consistent data for the period from 2000 to 2006, there was an overall 86% increase in the number of reported cases of newly diagnosed HIV infection among MSM [2]. Among these countries, in those reporting at least 20 new diagnoses of HIV infection among MSM in 2006, more than doubling of cases since 2000 was observed in five countries, with the highest increase of more than three times reported from Slovenia [2].

HIV surveillance data are vital to monitor the trends of the HIV epidemic and evaluate the public health response. Comprehensive HIV surveillance including routine behavioural surveillance and HIV prevalence monitoring in addition to case-based national reporting systems for HIV and acquired immunodeficiency syndrome (AIDS) has been advocated for by the European Centre for Disease Prevention and Control (ECDC) and World Health Organization (WHO) Regional Office for Europe [1]. The main objective of the second generation HIV surveillance recommended by WHO and Joint United Nations Programme on HIV/AIDS (UNAIDS) is to monitor HIV and high-risk behaviour trends over time in order to provide essential data needed for the development of interventions and the evaluation of their impact [3,4].

During 1999-2008, HIV surveillance in Slovenia, coordinated by the National Institute of Public Health (NIPH), has been based on routine collection, analysis and interpretation of data from:

- mandatory universal reporting of newly diagnosed cases of HIV infection, AIDS and deaths among AIDS cases;
- monitoring of overall HIV diagnostic testing rates;
- monitoring of HIV infection prevalence in several easily accessible sentinel populations at higher behavioural risk: MSM, patients with sexually transmitted infections (STI) and injecting drug users (IDU); and in one population group with on average low behavioural risk: pregnant women;
- monitoring HIV infection prevalence among blood donors by collating information on mandatory testing of all donated blood or blood products; and
- monitoring selected behaviour indicators in two easily accessible sentinel populations at higher behavioural risk: MSM and IDU [5,6].

The aim of this paper is to present evidence of a disproportionate and increasing burden of HIV infection among MSM in Slovenia during the period from 1999 to 2008 using the second generation HIV surveillance data.

Methods

Case reporting

Reporting of HIV and AIDS has been mandatory in Slovenia since 1986. According to the Slovenian Communicable Diseases Act, physicians report anonymous individual data on newly diagnosed cases of HIV infection, AIDS and deaths among AIDS cases to the NIPH. European AIDS surveillance case definition has been used

[7]. SOUNDEX coding of surnames together with dates of birth were used as unique identifiers to eliminate duplicates. Information collected included transmission category; the proportion of HIV cases categorised as other/unknown was 12% in 2008 and during the last ten years varied between the highest 39% (in 1999) and the lowest 11% (in 2005 and 2007). HIV diagnosis was defined as late at CD4 cells count <350 mm^3; very late at CD4 cells count <200 mm^3; and extremely late when AIDS clinical stage was reported within three months of HIV diagnosis.

Monitoring diagnostic HIV testing

To complement and better interpret information from universal mandatory reporting of newly diagnosed cases of HIV infection, the NIPH monitored overall HIV diagnostic testing rates by annual postal surveys including all Slovenian laboratories performing HIV testing. Only information on overall absolute numbers of HIV tests performed and numbers of positive test results was collated.

Monitoring HIV infection prevalence in sentinel populations

Detailed methods for monitoring HIV prevalence in selected sentinel populations with unlinked anonymous testing (including laboratory HIV testing strategy) together with the results for the period from 1993 to 2002 have been published previously [6]. Ideally, monitoring HIV prevalence in the chosen sentinel populations should provide information with respect to all three major modes of HIV transmission: unprotected sexual intercourse with infected individuals, exposure to infected blood and infected mother-to-child [3]. At the NIPH we had chosen three sentinel populations at higher behavioural risk: MSM, STI patients tested for syphilis, and IDU entering substitution treatment and/or taking part in needle and syringe exchange harm reduction programmes. In addition, we have monitored HIV prevalence in a low risk sentinel population of pregnant women screened for syphilis, a population group which is more similar to the general population with respect to the level of risk for HIV transmission. We had decided to use unlinked anonymous testing because individuals with high-risk behaviour might be more inclined than those with lower-risk behaviour to refuse or avoid HIV testing and information on results from voluntary confidential testing might be biased [3,8]. Also, the logistics of such an approach is simple and the costs are relatively low. Here we briefly present the data collection methods for two sentinel populations, MSM and STI patients, the latter group including a substantial proportion of MSM. Figure 1 presents the geographical distribution of corresponding sentinel sites.

Since 1993, residual sera from specimens obtained from patients of STI outpatient services and sent for syphilis serology have been sampled continuously and consecutively in all participating syphilis serology laboratories. The second inclusion of specimens obtained from the same individuals during the same calendar year was prevented by keeping a separate list of identifying information on individuals whose sera had already been included. All specimens were labelled only with information about the type of sentinel population, sampling period, sentinel site, gender and age group, frozen and stored at -20ºC until testing.

Since 1996, one-day cross sectional studies have been repeated annually by the NIPH in collaboration with a MSM non-governmental organisation (SKUC MAGNUS: 1996-2005; Legebitra: 2006-2008) at one sentinel site, a MSM community venue in the capital city Ljubljana. Saliva specimens have been voluntarily obtained from all men attending the event for unlinked anonymous testing for HIV surveillance purposes. All specimens were labelled only with information about the type of sentinel population, sampling period, sentinel site and age group. During these events, safer sex including condom use has been promoted and information about access to voluntary confidential or anonymous counselling and HIV testing has been provided.

Monitoring selected behaviour indicators

Since 2000, the NIPH has added a behavioural surveillance component to the HIV prevalence monitoring with unlinked anonymous testing in the sentinel population of MSM at a community venue in Ljubljana. All men participating and contributing a saliva specimen have also been invited to anonymously complete a short self-administered questionnaire. Behavioural data collected included information on condom use at anal sex, number of male partners and HIV testing during the year preceding the survey.

Results

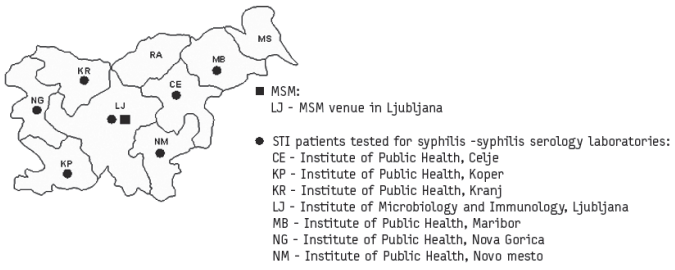
Of a total of 48 newly diagnosed HIV infection cases reported for 2008 (23.5/million population), 34 cases, representing more than two thirds, were MSM. Since 1999, the annual reported rate of newly diagnosed HIV cases in MSM raised from 2.5 to 16.7 per million general population (Figure 2), which corresponds to 7.1 and 46.8 per million men 15-64 years old, an increase of more than six times. The overall increase in the number of newly diagnosed HIV cases in Slovenia during recent years has been due almost exclusively to the increase in new diagnoses among MSM.

During the same period, the proportion of MSM presenting with AIDS defining illness within three months of HIV diagnosis declined from 60% to 21% and the proportion of MSM with CD4 cells count <200/mm^3 at HIV diagnosis declined from 80% to 32% (Figure 3). However, the rate of extremely late diagnosis (AIDS within three months of HIV diagnosis) increased from 4.3 cases per million men 15 to 64 years old in 1999 to 9.6 cases per million men 15 to 64 years old in 2008 and the rate of very late diagnosis (presenting with CD4 cells count <200/mm^3) increased from 5.7 cases per million men 15 to 64 years old in 1999 to 15.1 cases per million men 15 to 64 years old in 2008.

In 2008, AIDS was diagnosed in seven MSM and in all seven cases clinical AIDS diagnosis was within three months of first HIV

Figure 1

Sentinel sites for HIV prevalence monitoring in MSM and STI patients using unlinked anonymous testing, Slovenia, 1999-2008



MSM: men who have sex with men
STI: sexually transmitted infections

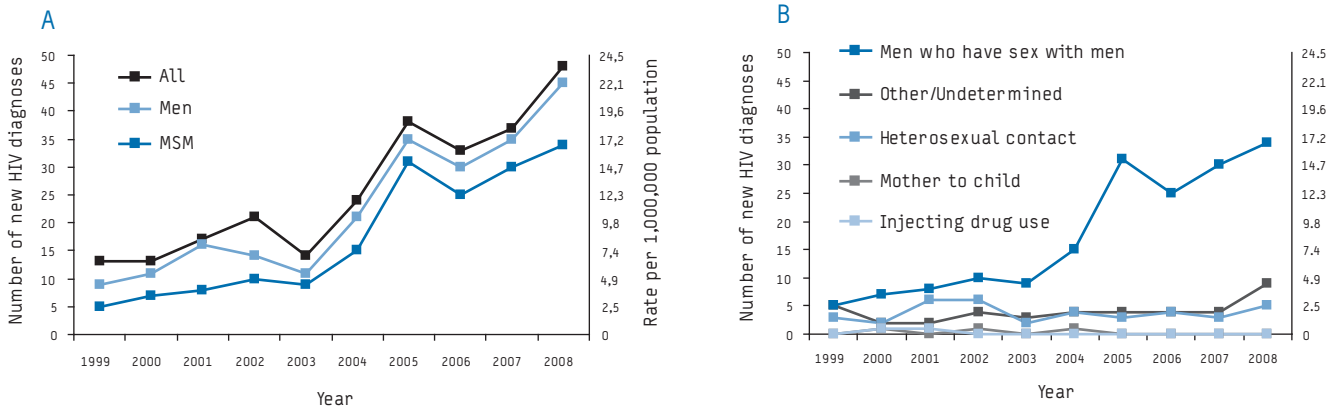
diagnosis. During the period from 1999 to 2008, the reported rates of AIDS diagnoses in MSM varied from 1.4 per million men 15 to 64 years old (in 2002) to 9.6 per million men 15 to 64 years old (in 2008). In 2008, death was reported for two MSM living with AIDS. During the period from 1999 to 2008, the corresponding death rates in MSM varied from 0 per million men 15 to 64 years old (in 2005 and 2006) to 2.9 per million men 15 to 64 years old (in 1999).

Overall HIV diagnostic testing rates (excluding unlinked anonymous testing for surveillance purposes and testing of all donations for blood and blood products safety purposes) remained relatively low during the last ten years, although an increase from 8.5 tests per 1,000 population in 1999 to 15.3 tests per 1,000 population in 2008 was observed. Overall, there were two positive test results per 1,000 HIV tests in 2008.

Some insight into recent changes in HIV testing uptake and sexual behaviour among MSM is provided by our sentinel behavioural surveillance in small convenience venue-based annual samples of MSM in Ljubljana. The proportion of MSM reporting an HIV test during the year preceding the survey increased from 29% in 2003 to 38% in 2008, suggesting a slight improvement in HIV testing uptake in this particular sentinel population (Figure 4). Overall, our data on selected sexual behaviour indicators for the period from 1999 to 2008, do not suggest a major deterioration

Figure 2

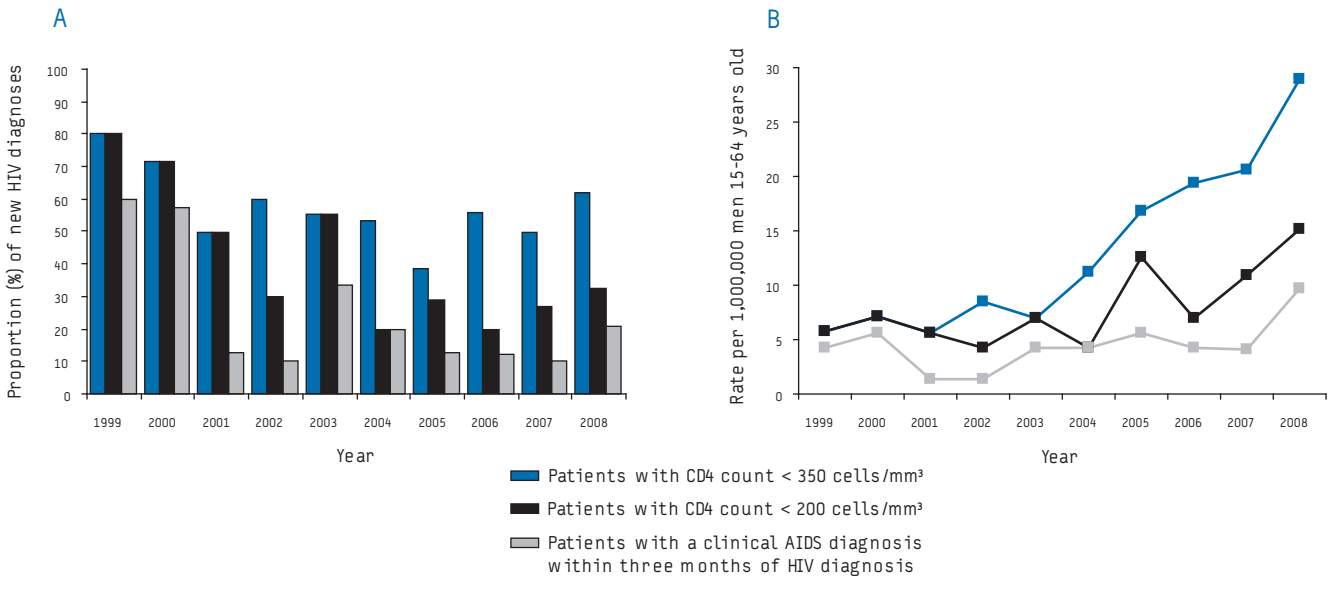
Newly diagnosed cases of HIV infection in Slovenia, 1999-2008: A) overall, among men, among MSM; B) according to transmission category



MSM: men who have sex with men

Figure 3

Late diagnosis of HIV infection among MSM, Slovenia, 1999-2008



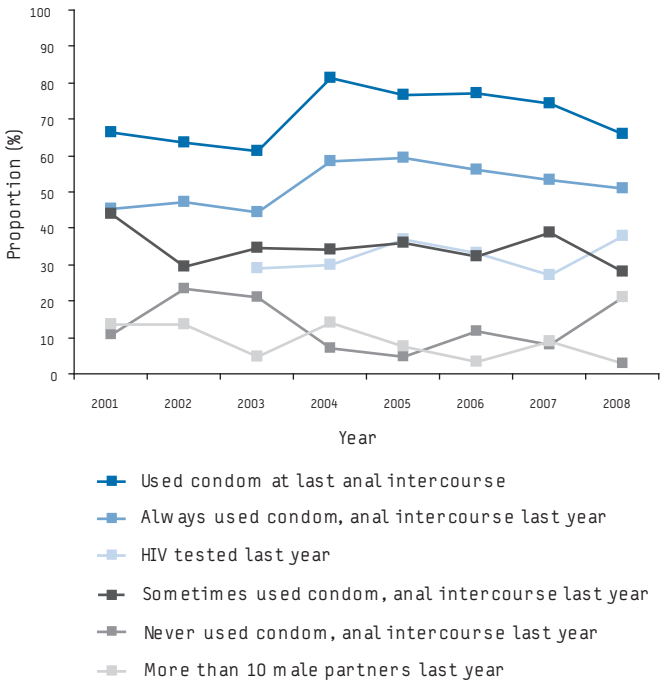
MSM: men who have sex with men

of safe sexual behaviour in this particular sentinel population of MSM. The proportion of MSM reporting 10 or more male partners during the year preceding the survey has remained below 10% since 2005 and since 2004 at least half of MSM have reported to have always used a condom at anal intercourse during the year preceding the survey. However, in 2008, the proportion of MSM who reported to have never used a condom at anal intercourse during the year preceding the survey raised above 20% after being below 20% since 2004 and the proportion of MSM reporting to have used a condom during the most recent anal intercourse decreased from 81% in 2004 to 66% in 2008, suggesting a recent slight deterioration in safe sexual behaviour among MSM in this particular sentinel population in Ljubljana.

During the period from 1999 to 2008, the prevalence of HIV in a national convenience sample of male clients of STI outpatient services tested for syphilis increased from 0% in 1999 to 3.4% in 2008 (Table). A substantial proportion of male clients of STI outpatient services in Slovenia are MSM and early syphilis cases among MSM, including MSM with known HIV infection, represented a substantial proportion of all early syphilis diagnoses during recent years (data not shown) [9]. During the same period, the prevalence of HIV infection among female clients of STI outpatient services tested for syphilis remained below 1% and the prevalence of HIV infection consistently remained below 5% in a sentinel population of MSM in Ljubljana. For comparison, the prevalence of HIV infection among convenience samples of pregnant women screened for syphilis during the same period (sample sizes varied from the smallest 6,900 sera in 1999 to the largest 8,963 sera in 2007) varied from 0% (years: 2001, 2003, 2007) to 0.01% (years: 1999, 2005).

FIGURE 4

Selected behavioural indicators in venue-based convenience samples of MSM, Ljubljana, Slovenia, 2001-2008



Note: The size of convenience samples of MSM recruited in 2001-2008 ranged from 68 in 2006 to 124 in 2008 (average: 89). The proportions shown in the Figure are based on the number of responses to individual questions (range: 59-124)

MSM: men who have sex with men

Discussion and conclusion

The burden of HIV among MSM in Slovenia is disproportionately high and increasing fast. HIV cases among MSM represent the greatest proportion among all new HIV diagnoses and the substantial increase in the number of newly diagnosed HIV cases during recent years has been due almost exclusively to the increase in new diagnoses among MSM.

The former European Centre for the Epidemiological Monitoring of HIV/AIDS (EuroHIV) compared the annual burden of new HIV diagnoses among MSM calculated per 100,000 men 15 to 64 years old for European countries for the year 2006 [2]. For three countries these rates were above 100 per 100,000, for 10 countries between 50 and 100 per 100,000 and for 14 below 50 per 100,000. Slovenia with the rate of 35 newly diagnosed HIV cases in MSM per 100,000 men aged 15-64 in 2006, was in the third group. However, an analysis of trends in these reported rates for 23 countries with consistent HIV reporting systems showed an overall increase in 2006 in comparison to 2000 of 86% while for Slovenia the corresponding increase was 260%.

Our national HIV surveillance data suggest that the recent increase in the reported numbers of newly diagnosed HIV cases among MSM in Slovenia may at least in part reflect a true increase in HIV incidence in this group and some deterioration of safer sex behaviour.

Some insight into recent changes in sexual behaviour among MSM is provided by our sentinel behavioural surveillance in small convenience venue-based annual samples of MSM in Ljubljana. Both the proportion of MSM who reported to have never used a condom at anal intercourse during the year preceding the survey and the proportion of MSM reporting to have not used a condom during the most recent anal intercourse increased in 2008, suggesting some deterioration of safe sexual behaviour among MSM in this particular sentinel population in Ljubljana. Recent increases in overall early syphilis reported rates in Slovenia (in 2008 increase of 130% compared with 2007), with great majority of cases occurring in men (94%) and among cases in men a substantial proportion of cases among men known to have sex with men (44%) and among those almost one in three with a foreign MSM partner within three months preceding syphilis diagnosis, suggest recent increase in unsafe sexual behaviour among MSM and sexual mixing of Slovenian MSM with MSM abroad [9]. Most worrying, two in three early syphilis cases reported in 2008 among MSM were men with known HIV infection, indicating unsafe sexual behaviour among HIV-positive MSM aware of their infection [9].

The overall HIV diagnostic testing rates in Slovenia have been relatively low in comparison to most EU countries [1], however it is not only important how many individuals are tested but also who is tested. The very simple method we use for monitoring national overall HIV testing rates does not provide data for understanding HIV testing rates in different patient groups (e.g. patients with tuberculosis or STI) or uptake of HIV testing in groups with different behavioural risk (e.g. MSM or IDU). So we do not have reliable information about whether HIV testing uptake has recently increased among MSM. However, our sentinel behavioural

surveillance in small convenience venue-based annual samples of MSM in Ljubljana provides some insight into recent changes in HIV testing uptake and the data suggest a possible slight increase in HIV testing uptake in this particular sentinel population of MSM.

Relatively low reported AIDS incidence and mortality among MSM with AIDS in Slovenia can be attributed to universal access to treatment and care including highly active antiretroviral treatment (HAART) introduced after 1996. However, although our surveillance data for the last 10 years show a reduction in the proportion of extremely late HIV diagnoses (AIDS diagnosis within three months) among MSM, at least half of HIV infections diagnosed annually among MSM with the exception of year 2005, were late (CD4 cell count below 350/mm^3), indicating that we have been missing opportunities for early treatment of HIV infection and positive prevention among MSM.

Our national HIV surveillance system with different components including behavioural surveillance and HIV prevalence monitoring in high-risk behaviour sentinel populations such as MSM and STI patients in addition to case-based national reporting systems for HIV and AIDS provides fairly good information about the distribution, trends in time and potential spread of HIV infection in Slovenia with rather modest investment of resources. It also provides public health decision makers with some insight into how successful HIV prevention, treatment and care interventions have been. The strengths of our monitoring of HIV infection prevalence in easily accessible sentinel populations of STI patients and MSM and monitoring selected behaviour indicators in a sentinel population of MSM in Ljubljana are minimal participation bias, anonymity, feasibility, sustainability and relatively low costs. The limitations include very small sample sizes to reliably monitor prevalence change and non-availability of additional risk behavioural information (e.g. history of sharing injecting equipment among MSM). We should be very cautious when inferring about the distribution and spread of HIV infection among all MSM and STI patients in Slovenia, as these easily accessible sentinel populations are not representative for all MSM and STI patients. Also the validity of self-reported behavioural data can always be questioned, but, if this bias does not change with time, such an approach is good for monitoring trends in self-reported behaviour among MSM. Overall, the results of our second generation HIV surveillance system are very informative and enable crude monitoring of trends in prevalence of HIV and selected behaviour indicators and early warning.

The burden of HIV among MSM in Slovenia is disproportionately high and increasing fast. Prevention and control of HIV and STI among MSM largely depends on supporting safe sexual behaviour among MSM, promoting uptake of HIV testing, and promoting HIV and STI healthcare seeking behaviour. Also, understanding sexual behaviour and needs of MSM with diagnosed HIV infection and positive prevention interventions among MSM are urgently needed.

Table

HIV infection prevalence among MSM and STI patients, results of unlinked anonymous testing for surveillance purposes, Slovenia, 1999-2008

	Year	Number of sentinel sites	Number of tested individuals		Number of infected individuals		Proportion of infected individuals	
			Male	Female	Male	Female	Male	Female
MSM	1999	1	120		2		1.7 %	
	2000	1	132		4		3.0 %	
	2001	1	101		3		3.0 %	
	2002	1	113		0		0 %	
	2003	1	101		1		0.9 %	
	2004	1	79		2		2.5 %	
	2005	1	82		3		3.7 %	
	2006	1	94		2		2.1 %	
	2007	1	124		3		2.4 %	
	2008	1	137		3		2.2%	
STI patients	1999	5	305	153	0	0	0 %	0 %
	2000	6	279	107	0	0	0 %	0 %
	2001	6	147	83	0	0	0 %	0 %
	2002	7	334	201	1	1	0.3 %	0.5 %
	2003	7	267	200	1	0	0.4 %	0 %
	2004	7	328	148	5	0	1.5 %	0 %
	2005	7	403	170	1	1	0.2 %	0.6 %
	2006	7	419	211	10	0	2.4 %	0 %
	2007	7	484	257	11	0	2.3 %	0 %
	2008	7	677	264	23	2	3.4 %	0.8 %

MSM: men who have sex with men
STI: sexually transmitted infections

Finally, preventive responses targeted to MSM at the national level only may not be enough. MSM are highly mobile and there is substantial sexual mixing also between countries. Preventive interventions for MSM should probably be synchronised at the EU level and coverage, quality and impact of these programmes should be monitored on international level.

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HIV infections and STI co-infections in men who have sex with men in Belgium: sustained increase in HIV diagnoses

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Belgium is currently experiencing an upward trend in the number of new HIV diagnoses characterised by a continuous increase in the number of cases among men who have sex with men (MSM). Based on surveillance data, in the past decade the yearly number of newly diagnosed HIV cases in MSM increased more than threefold, from 101 cases diagnosed in 1999 to 332 cases in 2008. During this period, the majority of new HIV infections in MSM were diagnosed among Belgians citizens (72%), followed by other European nationalities (13%). The increase in HIV diagnoses does not reflect an increase in HIV testing since the number of tests performed nationwide remained remarkably stable over time. The steady increase in the number of newly diagnosed HIV cases among MSM, and the high proportion of MSM among HIV-positive patients co-infected with other sexually transmitted infections (STI) (95.6% in 2008) indicate increases in unsafe sex practices in this group. Development of behavioural surveillance and more qualitative research on reasons for unsafe sex are needed in order to develop more effective prevention strategies.

Introduction

Re-emergence of the HIV epidemic and continuous high notification rates of newly diagnosed HIV cases in men who have sex with men (MSM) have been observed in many Western European countries. [1-7] Diagnoses of concurrent other sexually transmitted infections (STI) have also increased substantially. In this paper, based on surveillance data collected by the Unit of Epidemiology at the Scientific Institute of Public Health in Brussels, we describe the trends and epidemiological features of HIV and STI among MSM in Belgium.

Methods

HIV infection

The total number of screening tests was provided by the National Institute for Sickness and Invalidity Insurance (INAMI-RIZIV) based on reimbursement figures. HIV testing is widely available and used in Belgium. People may seek HIV testing from their general practitioner, a hospital or a family planning centre.

All serums with positive screening test results are submitted for confirmation to one of the seven AIDS Reference Laboratories. For each confirmed test, a form is sent to the patient's clinician. Based on biology results and information collected at the consultation, the clinician provides data on age, sex, nationality, residence, sexual orientation, probable mode of HIV transmission and CD4 count at the time of HIV diagnosis. Data are validated for duplicate recording and included in a HIV database maintained at the Scientific Institute of Public Health in Brussels since 1985. In 1990, HIV and AIDS databases were integrated.

Sexually transmitted infections

Data on co-infections of HIV and other STI in MSM were collected from the Belgian AIDS Reference Centres. These centres are specialised in STI/HIV counselling and treatment. Seven of the nine medical Centres participate since the beginning of 2007 in the ongoing surveillance of STI. The reported STI included chlamydia, gonorrhoea, syphilis, lymphogranuloma venereum (LGV), hepatitis B virus infection (HBV) and sexually acquired hepatitis C virus infection (HCV). In the surveillance system, only recent, active syphilis infections have to be reported; no information on stage of disease is collected. For hepatitis B and C, only acute infections have to be reported. In order to minimise the workload for the voluntarily participating physicians, no information on the laboratory testing results is collected.

Statistical methods

Stata 10 (Statacorp, College Station, Texas, US) was used for analysis and proceeding. Logistic regression was used to analyse factors for late HIV diagnosis.

Results

HIV infection

In 2008, there were 1,079 persons newly diagnosed with HIV in Belgium. This is the highest number ever reported. During the

Figure 1

Newly diagnosed HIV infections per million population in Belgium, 1985-2008

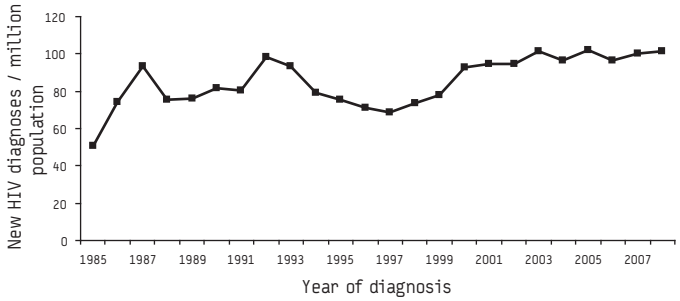


Figure 2

Newly diagnosed HIV cases per mode of transmission, Belgium, 1997-2008

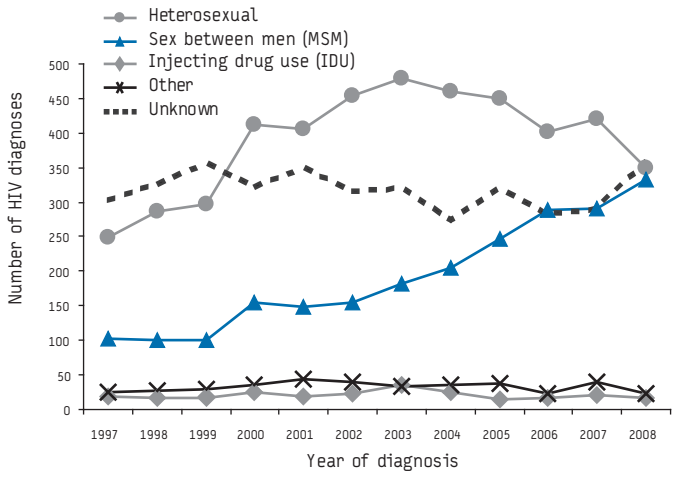


Figure 3

Newly diagnosed HIV infections in men who have sex with men (MSM) per 100,000 population in the respective male age groups in Belgium, 1999-2008

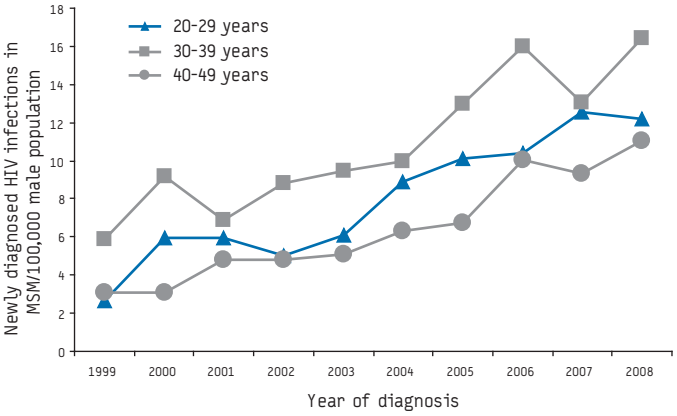
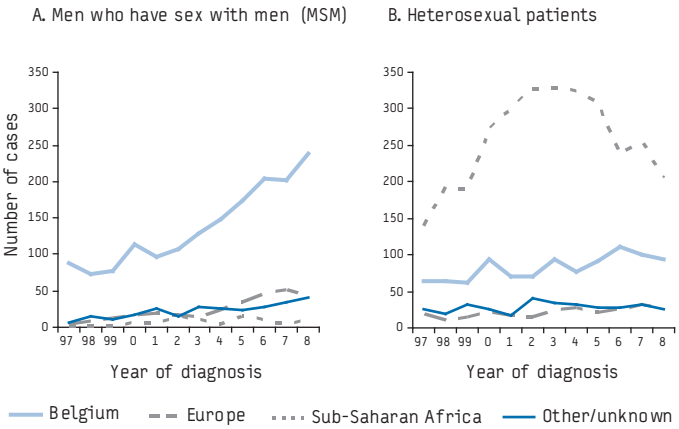


Figure 4

Nationality of newly diagnosed HIV cases in Belgium, 1997-2008



period 2003-2008, a plateau was observed; the rate of newly diagnosed cases of HIV infection fluctuated between 96 and 102 per million population (Figure 1). Before this plateau phase, the rate of newly diagnosed cases had increased by 47%, from 69 per million in 1997 to 101 per million in 2003.

In the past decade, the yearly number of new HIV diagnoses in MSM increased by 228%, from 101 cases diagnosed in 1999 to 332 cases in 2008 (Figure 2). The proportion of MSM among all newly diagnosed HIV cases for whom the probable transmission mode was known increased from 23% in 1999 to 46% in 2008. During the same period, the trend in new HIV diagnoses in heterosexuals was reversed: in a first phase the yearly number of new diagnoses increased by 61%, from 298 cases diagnosed in 1999 to 480 cases in 2003; in a second phase, this number decreased by 27% to 350 cases diagnosed in 2008 (Figure 2).

In 2008, almost half of HIV diagnoses were in MSM (46%), even if heterosexual transmission remained the predominant reported mode of infection (48%). Only 2% of patients were infected by intravenous drug use. Transmission mode data were available for approximately 70% of new diagnoses.

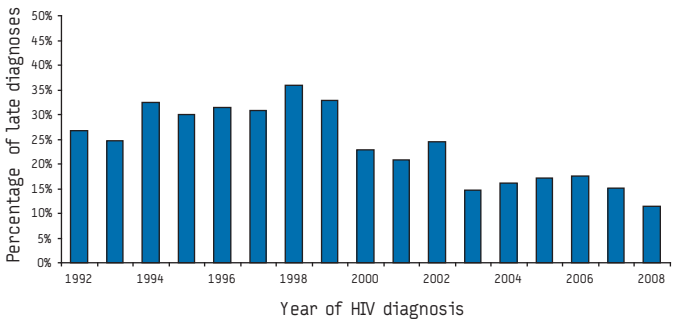
During the period 1999-2008, increasing rates of newly diagnosed HIV cases in MSM per 100,000 male population were observed among all age groups: the rate in age group 20-29 years increased by a factor 4.5, and the rates in age groups 30-39 years and 40-49 years by factors 2.8 and 3.5 respectively (Figure 3). The median age of MSM at time of diagnosis remained constant. For the period 1999-2008, the median age was 37 years.

The majority of new HIV infections in MSM were diagnosed among Belgians citizens (72%), followed by other European nationalities (13%). Among new diagnoses in heterosexuals, 59% were patients from sub-Saharan Africa, and 27% were of Belgian nationality (Figure 4).

Surveillance data suggest that HIV testing behaviour evolved in MSM and that significant improvement was made regarding early HIV diagnosis during the last years. A steady and significant increase of CD4 count at HIV diagnosis was observed between 2001

Figure 5

Proportion of late HIV diagnoses among men who have sex with men (MSM) in Belgium, 1992-2008



Late diagnosis defined as CD4 <200mm^3 at HIV diagnosis or AIDS diagnosed within three months of the HIV

and 2008, suggesting that HIV infections were diagnosed earlier in recent years. The mean CD4 count at HIV diagnosis among MSM was 526 in 2008 versus 395 in 2001 (p<0.001).

Furthermore, the proportion of late HIV diagnoses (defined as CD4 cell count < 200 per mm^3 at diagnosis or AIDS diagnosed within three months) among MSM significantly decreased over time (Figure 5). In a multivariate analysis controlling for time of diagnosis and nationality, older age was independently associated with late HIV diagnosis (p<0.001).

HIV testing

An average of 56 HIV tests per 1000 population are performed nationwide yearly, excluding tests related to blood donations. The number of tests performed remained remarkably stable over time, varying between 51 and 57 HIV screening tests per 1,000 individuals per year during the period 1997-2008.

Sexually transmitted infections

For 2008, seven of the nine AIDS Reference Centres reported 267 episodes of STI diagnosed in 241 MSM living with HIV. MSM represented 95.6% of all HIV-positive patients reported with a new STI episode in these centres for 2008 (Table). In 215 cases, patients were aware of their HIV status at the time of the STI consultation. In 26 cases (10.8%), HIV infection was diagnosed at the STI consultation.

Among 162 syphilis diagnoses, 67 (41.4%) were reported as re-infections. In 26 patients (10.8%), two STI other than HIV were diagnosed at the same time. Syphilis was associated with chlamydia in eight cases, with LGV in six cases, with HCV in three cases and with gonorrhoea in one case. Gonorrhoea was associated with chlamydia in five cases and with LGV in three cases.

Discussion

After years of steady decrease, from 1997, a reverse has been observed in the number of newly diagnosed HIV infections in Belgium [7].

In 2008, the number of reported new HIV diagnoses among MSM was higher than ever since the beginning of the epidemic, including among young MSM. The increasing trend in Belgian MSM was continuous from 1999 until 2008, while the numbers reported in heterosexuals of sub-Saharan origin seem to decrease in recent years.

Changes in HIV testing may influence trends in HIV diagnoses [8]. In Belgium however, the increase in HIV diagnoses does not reflect an increase in HIV testing since the number of tests performed nationwide has remained remarkably stable over time. On the other hand, increasing trends may partially reflect changes in the targeting of most at-risk groups during the period 1997-2008, as suggested by the fact that MSM are diagnosed earlier in recent years. Testing promotion campaigns focused on MSM have been launched in recent years.

The steady increasing trend in newly diagnosed HIV infections among MSM, and the high rate of co-infections with other STI are worrying [9-10]. In 2008, in 11% of HIV-positive MSM co-infected with STI reported by the participating AIDS Reference Centres, HIV seropositivity was discovered following the STI consultation. This finding underlines the importance of offering an HIV test to patients presenting with a STI.

These observations corroborate recent studies indicating increasing prevalence of sexual risk behaviour among MSM, including those who are aware of their HIV-positive status. A survey in the French Community of Belgium carried out in 2004 and 2005 among 942 MSM pointed out that although the majority of the respondents mentioned a high level of protection during anal intercourse, a quarter of respondents had at least one unprotected anal intercourse in the last year with a partner whose status was unknown or different from their own [11]. Moreover, HIV-positive men and men who were not sure about their HIV status, were found to be more likely to admit unprotected anal intercourses [11]. In the Flemish Community of Belgium, 1,793 MSM completed an internet questionnaire in 2007; this study found a higher rate of STI infections among HIV-positive MSM compared to HIV-negative MSM. The characteristics associated with sexual risk behaviour in this study were drug use, lower educational level, lower score on mental health, less social support, more sensation seeking and more sex partners [9].

It is essential to adapt and to reinforce prevention interventions aimed at risk groups. The survey conducted in the French Community showed that knowledge of ways of transmission and treatment of HIV among respondents was good, nevertheless many engaged in high-risk sexual practices. Hence, while providing information on HIV and STI remains necessary, it is not sufficient and has to be combined with other preventive interventions. Development of behavioural surveillance and more qualitative research on reasons why people practise unsafe sex are needed in order to develop more effective prevention strategies.

Table

Sexually transmitted infections (STI) diagnosed in HIV-positive men who have sex with men (MSM) in Belgium, 2008

STI diagnoses	Number of episodes
Syphilis	162
Chlamydia	29
Gonorrhoea	29
Lymphogranuloma venereum (LGV)	31
Hepatitis C (HCV)	14
Hepatitis B (HBV)	2
Total*	267

*Total number of STI episodes diagnosed in 241 MSM living with HIV

Acknowledgements

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Viral hepatitis among men who have sex with men, epidemiology and public health consequences

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Viral hepatitis causes major disease burden worldwide, due to the chronic hepatitis sequelae: cirrhosis and primary liver cancer. Transmission of viral hepatitis is a problem not only in low-income countries, but also in high-income ones where viral hepatitis is a frequently occurring infection among men who have sex with men (MSM). Although the transmission routes of the three main hepatitis viruses, A, B and C, differ, MSM mainly acquire viral hepatitis during sexual contact. Vaccination programmes (only available for hepatitis A and B), raising awareness, and screening can be used to prevent transmission. However, despite the introduction of such methods in many high-income countries, the spread of viral hepatitis among MSM is still ongoing. This paper provides an overview of sexually acquired hepatitis A, B, and C among MSM in high-income countries, using recent insights obtained through molecular epidemiology, with the aim to raise awareness, improve vaccination coverage, and stimulate prevention programs.

Introduction

Worldwide, more than two billion people are infected with viral hepatitis A, B or C (HAV, HBV or HCV, respectively). Although the clinical symptoms of these infections are largely similar and include fever, malaise, and jaundice, their frequency and severity differ. HAV is symptomatic mainly in adults, whereas infections with HBV and especially HCV are often asymptomatic. The transmission routes of HAV, HBV, and HCV also differ: HAV spreads through faecal-oral contact, HBV is transmitted by blood contact as well as by sexual contact, and HCV is mainly transmitted by blood contact [1-3]. HAV is self-limiting, a fulminant course of infection is rare and the case fatality rate is low (0.3%). In contrast, 5-10% of adults with acute HBV infection and 50-80% of individuals with acute HCV infection develop persistent viraemia [4, 5]. Over decades, chronic infection with HBV and HCV can lead to liver cirrhosis, hepatocellular carcinoma and eventually death. Spontaneous viral clearance of HAV and HBV, but not HCV, results in life-long immunological protection. HCV re-infection, on the other hand, is frequently observed in individuals with ongoing risk behaviour [6].

In high endemic countries, HAV is mainly transmitted by close contact or as a result of inadequate sanitation (e.g. ingesting contaminated food or water), HBV is mainly transmitted at birth or during early childhood whereas new HCV infections are often health-care associated. In contrast, the majority of new HBV and HCV infections in low endemic countries occur within specific risk groups. HBV spreads among drug users and sexual risk groups, such as men who have sex with men (MSM) and commercial sex workers, whereas HCV has been traditionally restricted to injecting drug users and, before donor screening was introduced, to recipients of blood and blood products. In low endemic areas, new HAV infections occur mostly among travellers returning from high endemic places, causing small outbreaks among unvaccinated children or adults at, for example, child care centres, or among MSM via oro-anal contact [1-3].

There is no specific treatment available for HAV. For chronic HBV carriers treatment includes interferon and nucleoside analogues, while pegylated-interferon, in combination with ribavirin, is available for chronic HCV [1, 2]. For both viruses, but especially chronic HBV, treatment does not always result in viral eradication. An effective vaccine, which gives 20 years to life-long protection, is available for HAV and HBV, while no vaccination is as yet available for HCV, meaning that prevention relies totally on precautionary measures that prevent its further spread [1-3].

In this article, we provide an overview of sexually acquired viral hepatitis among MSM, using recent insights obtained through molecular epidemiology of HAV, HBV, and HCV. In addition we want to stress that, among MSM, awareness and risk perception regarding viral hepatitis needs to be improved in order to increase vaccination coverage and limit further spread of these viruses among the MSM community.

Hepatitis A

In high-income countries such as those in Western Europe and North America, HAV is rarely contracted during childhood, therefore the majority of adults are susceptible to the infection. Individuals living in low endemic countries can contract HAV when they travel to developing countries where the virus still circulates widely. HAV has for many years also been recognised as a sexually transmitted infection (STI), especially among MSM. In Scandinavia – one of the first areas where the incidence and prevalence of HAV declined strongly - outbreaks of hepatitis A among MSM were already reported about three decades ago [7, 8]. In a cohort study of MSM in Amsterdam, performed at the time of the Scandinavian outbreaks, 42% of 689 MSM tested positive for HAV antibodies.

HAV prevalence was shown to increase with the time the person had been homosexually active, and strongly exceeded the prevalence in the general population [9]. Among susceptible MSM, the HAV incidence was about 7% per year and correlated with the number of sexual partners. Other early studies identified oro-anal sexual contact as the most likely transmission route among MSM [10]. In recent years, outbreaks of hepatitis A among MSM have been described in most high-income countries [11].

The molecular typing of HAV isolates is used to gain a better insight into how HAV spreads among the population. In a study in Amsterdam in 2000-2002, HAV isolated from stool samples of acute HAV cases was amplified and sequenced [12]. Two separate transmission chains with little mutual interrelation were found: one among MSM (mostly genotype 1A) and another among travellers from HAV-endemic countries (genotype 1B and genotype 3). The patterns of HAV introduction and transmission in these groups were further investigated, using cluster analysis based on the genetic distances between the HAV isolates obtained during the acute phase of infection [13]. Large clusters were found among MSM, indicating the ongoing spread of specific HAV viruses among this group.

Among travellers, introductions of new HAV strains from endemic countries occur regularly, especially after the summer holidays. Transmission to close contacts occurs on a limited scale. These outbreaks are usually detected early and stopped through preventive measures (vaccination).

Recently, a collaborative European study was undertaken to determine if HAV strains that cause outbreaks among MSM in different countries are genetically related [11]. By comparing sequences, it was shown that the majority of strains found among MSM in the participating European countries formed closely related clusters belonging to genotype 1A. Similar strains found among MSM during a nearly 10-year period (1995-2005) indicated that these specific strains have been circulating among this risk group for a long time. This shows that HAV is transmitted through sexual networks of MSM throughout Europe and possibly other high-income countries.

Although co-infection of HIV and HAV suggests no impact of HAV infection on the progression rate of HIV, HIV-positive patients co-infected with HAV should be carefully monitored since their HAV infection is more likely to be symptomatic and of longer duration [14]. There is also evidence for a higher lever of viraemia [15]. However, depending on the CD4 count (>200 cells/mm^3), HIV infection does not influence the outcome of acute hepatitis A [14].

Hepatitis B

Transmission of HBV is a problem not only in highly endemic countries, but also in low endemic countries with a low HBV prevalence and incidence. In these countries, transmission of HBV occurring at birth or during early childhood is rare, and the infection is mainly restricted to specific risk groups, such as MSM who acquire HBV mainly through sexual contact [16]. Injecting drug use (IDU) remains an important risk factor for HBV transmission, especially in eastern European countries. However, a decline in IDU HBV cases has been observed in many high-income countries in the past decade [17].

HBV can be transmitted through mucosal contact, making it not only a blood-borne virus, but also an STI. HBV has been recognised as an important STI among MSM for many years, especially as HBV is far more infectious than HIV. The HBV incidence among MSM is estimated to be twenty times higher than among the general population. The high prevalence, together with the increased transmission rates associated with unprotected anal intercourse, makes MSM more prone to becoming infected with HBV than the heterosexual population.

In the 1980s, a steep decline was observed in HBV incidence among MSM [18, 19]. From the 1990s to date, the incidence has remained stable at a low level with some small fluctuations. The steep decline in the 1980s probably reflected a decrease in sexual risk behaviour among MSM caused by HIV/AIDS awareness. No such change in incidence was observed for HAV, most likely due to ongoing transmission through the faecal-oral route and since the perception of the risk of an HAV infection is low. HCV incidence follows a different course, which is described in the next paragraph.

Recent molecular epidemiological studies have shown that an identical HBV genotype A strain has been circulating among MSM for many years. This is not only the case in Europe, for example, in the United Kingdom and the Netherlands, but also in other countries around the globe, like Japan [19-21]. For HAV and HCV, several studies have shown that there is ongoing transmission of several different MSM-specific viral strains within MSM networks [11,22]. Thus far, research indicates that just one HBV strain circulates among MSM in high-income countries. A reason for this could be that genotype A is the predominant genotype in many of these high-income countries. Furthermore, due to the high stability of the HBV genome, it is hard to make a clear distinction between new introductions and ongoing transmission of certain strains compared to HAV and HCV. Another reason could be that in these studies, only the S-gene was sequenced, therefore, regarding the low variability in the genome, it might be better to do full genome sequencing analyses. To ascertain whether this single genotype A strain is the only strain circulating among the majority of MSM in high-income countries, further international collaboration, including testing of samples from a larger set of countries, is needed.

In the MSM community, 6-10% of HBV-infected men are co-infected with HIV [23]. HBV is more progressive in HIV-positive patients, and both the HBV carrier rates and the viral load are higher. The episodes of HBV activation are also more frequent, cirrhosis occurs more rapidly and hepatocellular carcinoma is more frequent than in HBV mono-infected patients [23]. When there is co-infection with HIV, HBV treatment options are limited and treatment outcomes are negatively influenced. Mono-therapy for both HIV and HBV is not appropriate due to the high possibility of resistance [23]. Since many of the antiviral agents used for HBV treatment are included in the HAART regiment against HIV as well, caution should be taken when starting treatment for either HBV or HIV.

Hepatitis C

HCV is primarily transmitted by exposure to infected blood. In high-income countries, parenteral risk factors, particularly IDU, now account for the vast majority of HCV transmissions [1]. Even in the presence of HIV co-infection, HCV is rarely transmitted through heterosexual intercourse [24]. However, recent outbreaks of acute HCV among HIV-positive MSM who deny IDU suggest that the epidemiology of HCV transmission is changing in this population. In several European countries [25-27] as well as in the United

States [28] and Australia [29], HCV has unexpectedly emerged as an STI among HIV-positive MSM. Longitudinal cohort studies have confirmed a marked increase in HCV incidence among HIV-positive MSM, but not HIV-negative MSM, after the year 2000. In Amsterdam, HCV incidence rose 10-fold to 8.7 per 1,000 person years in the period 2000-2003 compared with 0.8 per 1,000 person years in the period 1984-1999 [27]. The HCV prevalence among HIV-positive MSM visiting the STI clinic in Amsterdam reached an alarming 15-20% in the period 2007-2008, versus an estimated 1-4% before 2000. HCV prevalence found among HIV-negative MSM was significantly lower (0.4%) in this study [30]. Also in London, the estimated annual HCV-incidence in HIV-positive MSM attending HIV and sexual health clinics rose by 20% each year to 12 per 1,000 person years in the first six months of 2006 [31]. To what extent HCV affects communities of HIV-positive MSM in other high-income countries remains unclear.

Molecular typing of HCV isolates confirmed the presence of MSM-specific transmission networks in London [25], Paris [26] and Amsterdam [27]. A collaborative phylogenetic study revealed that these locally reported outbreaks were in fact part of one larger interconnected European transmission network [22]. MSM-specific HCV strains, mainly of difficult-to-treat HCV genotypes 1 and 4, were detected in 86% of European MSM with acute HCV. Once introduced, these strains rapidly spread to neighbouring countries; in fact, 74% of European HCV/HIV co-infected MSM were infected with MSM-specific strains that circulated in more than one European country. In contrast, the HCV outbreak in Australia showed very limited overlap with the transmission network in Europe, and has a (much) larger proportion of infections attributable to concomitant IDU [22, 29].

The sudden emergence of HCV as an STI among HIV-positive MSM is poorly understood. As multiple strains of different HCV genotypes circulate among HIV-positive MSM, this suggests a behavioural change in MSM rather than evolution of the virus into a more virulent variant. Evolutionary analysis confirms that HCV had been introduced into the population as early as the 1980s, most likely from the IDU-scene, but its actual spread only started after 1996 [22]. This coincides with the introduction of HAART, which was followed by a decline in HIV risk perception and a rise in sexual risk behaviour among MSM [32]. Only one case-control study with detailed information on risk behaviour has examined its independent relation with acute HCV [25]. This study suggests that in the context of (traumatic) sexual practises, permucosal risk factors were associated with acute HCV infection. Rough sexual techniques, such as fisting; a higher number of sexual partners and group sex; co-infection with ulcerative STI such as syphilis, herpes, and lymphogranuloma venereum (LGV); sex under the influence of drugs (especially when applied anally); the use of rectal enema; and the presence of haemorrhoids have been identified as potential risk factors for sexually acquired HCV [25,30,33]. However, these factors cannot explain why there was no evidence of sexual transmission in the 1980s, a period in which STI and sexual risk taking were highly prevalent among MSM [27].

Nearly all MSM with acute HCV are co-infected with HIV. HIV infection might facilitate HCV transmission by increasing viral infectiousness through higher HCV viral loads in blood and semen [34] as well as viral susceptibility through HIV-impaired immunological control [35]. Even in the presence of preserved overall CD4 counts (>500 cells/mm^3), massive irreversible damage already occurs to the mucosal tissues of the gastrointestinal immune system in the first weeks of HIV infection [36] which could facilitate HCV entry through the mucosa. Moreover, serosorting (engaging in sexual contact with partners of the same HIV serostatus), which is considered a risk reduction strategy for HIV transmission, might fuel the epidemic of other STI, including HCV [37].

The emergence of HCV among HIV-positive MSM has serious clinical implications. HIV/HCV co-infection negatively influences the natural course of HCV infection, in particular when HCV is acquired after HIV and at an older age (>40 years) [28]. HIV/HCV co-infection is associated with lower rates of spontaneous viral clearance, accelerated progression to liver disease and less favourable treatment outcome [38]. HCV antiretroviral therapy achieves sustained virological response in less than 20% of HIV-positive individuals chronically infected with HCV genotypes 1 and 4. However, more favourable response rates have been reported for HIV-positive MSM treated during the acute phase of HCV infection [39].

Preventive measures against viral hepatitis in MSM

In high-income countries, MSM apparently are a major risk group for viral hepatitis. Several studies have shown that MSM-specific strains of HAV, HBV, and HCV circulate among the MSM community, strongly suggesting the presence of MSM-specific networks driven by sexual contact [11-13, 18-22, 26, 30, 40].

Universal vaccination for HAV is only recommended by the WHO in intermediate endemic countries; low endemic countries are advised to limit vaccination to risk groups, like MSM [41]. However, only a few high-income countries have implemented targeted vaccination campaigns for HAV. According to Jacobs *et al.*, the cost-effectiveness of the HAV/HBV combination vaccine in high-risk groups is higher than that of the HBV vaccine alone [42]. Therefore, to increase the HAV coverage, HAV vaccination should be considered for implementation within the existing HBV campaigns for MSM.

Preventive measures for HBV among MSM consist of vaccination and awareness campaigns as well as screening for chronic infections. Vaccination of close contacts and treatment of chronically infected patients reduce the number of secondary infections. Treatment of chronic HBV carriers is also in the interest of the infected patient, as it prevents the long-term sequelae of HBV. Despite the introduction of an effective vaccine more than 25 years ago and the implementation of universal or behavioural risk group vaccination strategies in most high-income countries years ago, HBV is still endemic among MSM. A reason for this ongoing transmission among MSM is that universal vaccination programmes among newborns, with or without catch-up vaccination among adolescents, have up till now left the adult MSM population at risk. Targeted vaccination fails to reach a substantial proportion of MSM at risk and appears to be insufficient to reduce the incidence among this group [43, 44]. Consequently, independent of the various countries' current prevention strategies, the majority of MSM will remain at risk of HBV infection for at least the next decade. Universal vaccination will eventually prevent the ongoing transmission of HBV among MSM, depending on the coverage of these programmes. In the meantime, efforts should be directed towards promoting the HBV vaccination of MSM as early as possible after they become sexually active and targeted at those who are at greatest risk [45].

HBV co-infection in individuals living with HIV increases liver-related mortality and morbidity, toxicity of antiretroviral therapy, and complicates treatment decisions. Therefore, all HIV-infected MSM should receive HBV vaccination. However, the response rate to HBV vaccination is lower (18-71%) and HIV-infected MSM are also less likely to achieve and maintain high (protective) anti-HBs titres [46]. The response rate to HAV vaccination in HIV-infected patients is also lower compared to immunocompetent individuals. The low CD4 cell count and not yet being on HAART are the two main reasons for this low response rate [46, 47]. Administrating higher vaccine doses, revaccination, or postponing vaccination until HAART reaches a higher CD4 count are the current strategies to achieve higher response rate to HAV and HBV vaccination [46, 48-50].

Depending on future improvements in treatment, systematic screening of the MSM population for chronic HBV infections might be feasible. In countries with a targeted vaccination strategy, screening for HBV is automatically embedded in the programme [43]. Screening of migrants, even those with a low HBsAg prevalence (2.2%), has been shown to be cost-effective, because early detection of chronic infections and referral of chronic carriers has a positive impact on liver-related health outcomes and prevents secondary infections [51]. Since in some countries, the HBsAg prevalence among MSM is comparable or even higher than in migrant populations, it is likely that HBV screening of MSM is cost-effective, as well.

Since no vaccination is available for HCV, HIV-infected MSM should be regularly screened for HCV infection. Early detection and treatment of HCV during the acute phase has been associated with a more favourable HCV treatment outcome [39]. Successful treatment prevents secondary infections to HIV-positive sexual contacts and could possibly prevent spill-over to the HIV-negative population [31]. In contrast to HCV screening of the general population, HCV screening of groups with an elevated risk, like IDU, is cost-effective [52]. HIV-infected MSM have now also been recognised as a high risk group for HCV infection. Therefore, screening of this group might also be cost-effective. Screening for HCV infection could be done regularly by, for example, an HIV specialist or at STI clinics for early diagnosis. STI clinics, especially, have the means, the knowledge and the reach to inform high-risk groups about emerging STI like HCV. In addition, because HAV is not yet well known as an STI, promotion of HAV vaccination should be stimulated.

Concluding remarks

Failure to control the spread of HBV among MSM despite the long-term availability of an effective vaccine indicates that vaccines alone are not sufficient to control STI among high-risk groups. Increasing risk perception and awareness of the clinical consequences of STI is essential. Nevertheless, in practice it appears to be difficult to reach MSM who are at high risk of STI, as many do not consider themselves to be at risk or are unaware of the severe clinical consequences of some STI. To limit the spread of viral hepatitis among MSM, raising awareness and increasing risk perception needs to be combined with vaccination programmes.

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