

ORIGINAL ARTICLES

Surveillance report

HIV INCIDENCE INCREASING IN MSM IN GERMANY:
FACTORS INFLUENCING INFECTION DYNAMICS

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After an initial peak in the mid-1980s, HIV incidence in men who have sex with men (MSM) declined in most western industrialised countries and then levelled off during the 1990s. Since the late 1990s, increasing numbers of newly diagnosed HIV infections in MSM have been observed in the majority of countries with large and visible MSM communities.

Based on a review of national and international behavioural surveillance studies of MSM and national HIV surveillance data, we propose a model for the HIV epidemic in MSM in Germany.

The model includes aspects such as individuals' increasing numbers of sexual partners and increasing frequency of unprotected anal intercourse, conditional condom use based on real or perceived HIV status of sexual partners (HIV 'serosorting') and sexual role assignments (insertive versus receptive based on HIV status (HIV 'seropositioning'), selection of partners and formation of sexual networks through seeking sexual partners on the internet, the introduction of HAART and changing HAART treatment strategies. All these aspects have been shown or are suspected to increase or decrease HIV transmission risk in MSM.

We conclude that increasing HIV incidence in MSM in recent years has been fuelled by a spread of HIV in high-risk sexual networks with an increasing proportion of infections transmitted during highly infective early HIV infection, acquired mostly from casual sexual partners.

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Key words: MSM, HIV incidence, sexual risk behaviour, sexual networks

Background

By the end of 2005, the number of people living with HIV (PLWHIV) in Germany was estimated at about 49 000, among a total population of 82.5 Mio. Around two thirds of all PLWHIV in Germany are estimated to be men who have sex with men (MSM) [1]. Since 2001, there has been a continuous increase in the number of newly diagnosed HIV infections in MSM. Over the same time period, similar increases of HIV diagnoses in MSM have been reported from the majority of western European countries in which HIV surveillance systems are established. These simultaneous increases of newly diagnosed HIV infections were preceded, accompanied or followed by increasing incidences of other sexually transmitted diseases in MSM, such as syphilis, gonorrhea and lymphogranuloma venereum [2,3].

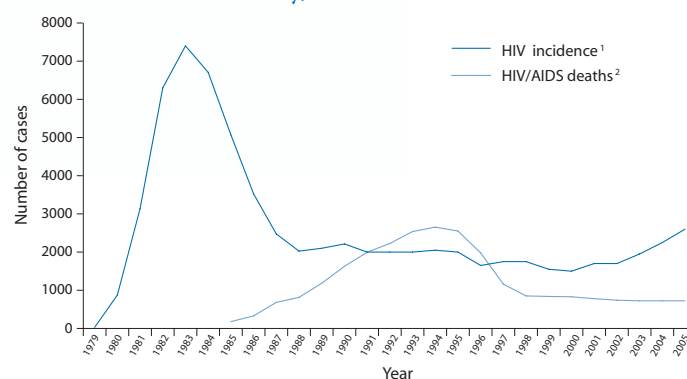
Introduction

Among the first consequences of the growing awareness of the HIV epidemic in gay communities in the early to mid-1980s was a dramatic reduction of partner numbers, followed in the late 1980s and

early 1990s by the increasing use of condoms within the context of casual sexual encounters. This decrease in sexual risk-taking resulted in reductions of transmission events and a shift of HIV transmission in MSM from casual sexual encounters towards more long-term partnerships, because internal relationship dynamics within such partnerships favour unsafe sexual behaviour [FIGURE 1].

FIGURE 1

Model of incident HIV infections and incident HIV/AIDS-related deaths in Germany, 1979-2005



Notes:

Estimates for HIV incidence from 1979 to 1991 based on AIDS back-calculation model (AIDS cases diagnosed up to 1995), from 1991 onwards based on numbers of newly diagnosed HIV infections

1. HIV incidence = estimated number of incident cases of HIV infection in Germany resp. in persons residing in Germany at the time of HIV infection (i.e. migrants from high prevalence areas excluded)

2. HIV/AIDS deaths = estimated number of deaths among people infected with HIV independent of the actual cause of death (estimates based on cause-of-death statistics, corrected for non-AIDS-related deaths based on the proportion of such deaths in selected regions, where HIV clinics match their patient data with vital statistics)

It is clear that something changed in the second half of the 1990s, because the incidence of sexually transmitted infections in MSM began to increase again, not just in selected countries or regions, but in all countries of the developed and developing world (such as Thailand and Brazil) that had large, organised and visible MSM communities.

Based on the findings of national and international behavioural surveillance data in MSM from recent years, and on the HIV surveillance data from Germany, we propose a model for the HIV epidemic in MSM in Germany that could explain the trends observed and identify relevant areas for future epidemiological and behavioural research.

Methods

The construction of a model for the MSM HIV epidemic in Germany is based on a review of national and international behavioural surveillance studies of MSM and HIV surveillance data.

The German HIV surveillance system has been described in

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detail elsewhere [4]; briefly, newly diagnosed HIV infections must be reported by laboratories with complementing patient history and clinical data provided by the primary care physician on a duplicate of the laboratory reporting form.

For Germany, the main data source for sexual behaviour changes in MSM are the national surveillance studies that have been performed every 2-3 years since 1987 [5].

Behavioural surveillance studies of MSM in western developed countries were identified by a Medline search using the search criteria 'MSM' and 'sexual risk behaviour', including studies published since 1998 from western Europe, Australia and North America.

Results

Behaviour changes in MSM

Recent studies on sexual risk behaviour of MSM have described a range of changes in sexual risk-taking behaviours in MSM in recent years. Many MSM report increased numbers of partners, there has been an apparent revival of anogenital practices and an increase in the proportion of unprotected episodes of anogenital intercourse. Other behavioural features are frequent HIV testing (in a recent internet-based survey in which over 45 000 MSM from Germany participated, 70% reported that they had been tested for HIV at least once, and 53% reported having had between two and five tests [6]), HIV 'sero-sorting', and HIV 'sero-positioning', and the growing importance of the internet for seeking and selecting sexual partners [3,5-12].

Number of sexual partners

German behavioural surveillance of MSM has found that MSM have been having increasing numbers of sexual partners since the early 1990s, after a short period during which MSM had decreasing numbers of partners, from approximately 1984 until 1989 [4].

While there was no clear evidence from the HIV surveillance system that increasing numbers of partners in MSM resulted in accelerated HIV transmission in subsequent years, the incidence of some sexually transmitted infections, which are more easily transmissible than HIV, may already have increased during this period, despite widespread condom use, because of transmission through sexual practices, which were usually performed without protection (e.g. genital-oral sex: no

data available for Germany, but see [13]).

Increase of unsafe sex

Sexual behaviour surveys in MSM in Germany [5] have repeatedly found evidence of increasing unsafe sexual contact in MSM since 1996, after a decade of continuously declining occurrence of unsafe sexual behaviour. The proportion of men reporting unsafe anal intercourse with partners of unknown HIV status, and the reported number of partners with whom unsafe sex is practised, have been increasing since 1996 [FIGURE 2].

Urban-rural differences, the internet, and the formation of high risk networks

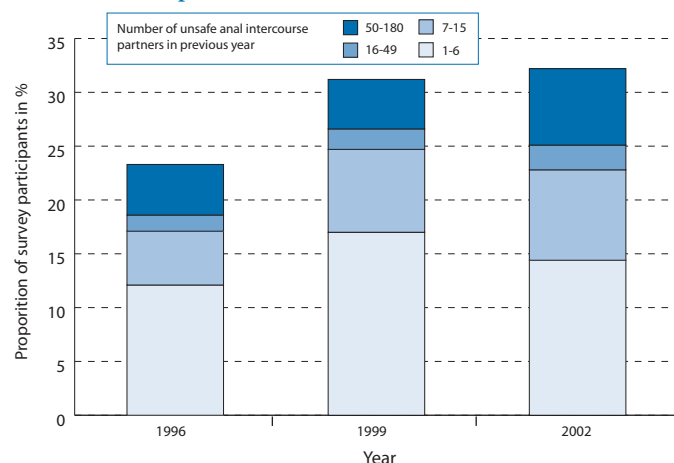
The wish to fulfil sexual desires, unconstrained by social and family supervision, results in a concentration of MSM in large cities, where gay bars, discotheques, bath houses, and a wide range of gay community organisations make it easier for MSM to seek and find sexual partners. Therefore, MSM living in metropolitan areas usually report higher numbers of sexual partners and higher incidences of sexually transmitted infections than MSM living in rural areas. Since the late 1990s, the increasing availability of the internet has led to more opportunities to seek and meet new sexual partners. The decreasing gap between MSM residing in metropolitan and rural areas in terms of partner numbers and (self-reported) STI incidences observed in the German behavioural surveys (data not shown) probably reflects the increased use and availability of the internet. However, the internet not only makes the search for new partners easier, it also allows for a more effective selection of partners, based on sexual preferences, HIV status, and also on the willingness to practise unsafe sex. This results in the formation of sexual networks suitable for fast and efficient spread of STIs [DIAGRAM] [14-16].

Improvement of antiretroviral therapy and changing treatment strategies

Since the availability of highly active antiretroviral therapies (HAART) from 1996, the number of people being treated with HAART (calculated based on antiretroviral drug sales) increased rapidly until 1998, and then levelled off, when problems associated

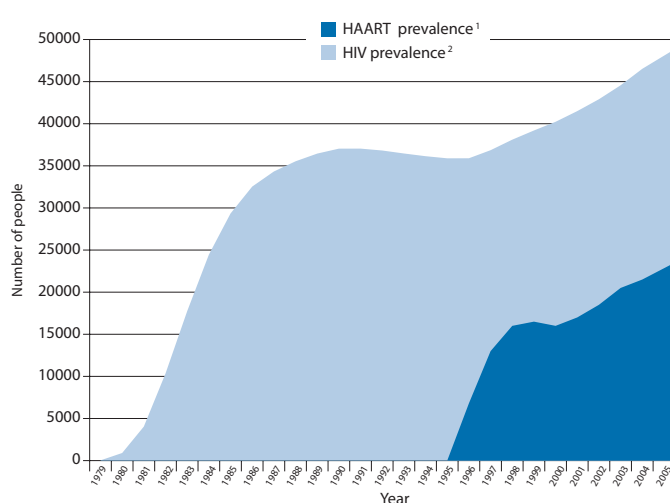
FIGURE 2

Proportion of MSM from metropolitan areas (Berlin, Hamburg, Munich, Frankfurt, Cologne) participating in behavioural surveys (N=1906), who reported unsafe sexual encounters (unprotected anal intercourse) during the year before the survey and the number of partners with whom unsafe sex was practised



Source: Repeated behavioural surveys among German MSM by Bochow/ Wright [4]

FIGURE 3
HIV prevalence model for Germany, 1979-2005



Notes:

1. HAART prevalence = total number of people infected with HIV and treated with highly active antiretroviral combination therapy (usually three or more antiretroviral agents in combination). The numbers are estimated based on monthly drug doses sold by pharmacies in Germany

2. HIV prevalence = total number of people living with HIV in Germany at the respective time point, calculated by subtracting the cumulative number of deaths among people with HIV from the cumulative number of people infected with HIV

with long term toxicities of HAART began to emerge in 1999/2000. HAART is nowadays initiated later in the course of HIV infection. The numbers of people living with HIV, but being not treated with HAART, decreased sharply from 1996 to 1999, but has since begun to increase slowly [FIGURE 3].

After 1996, HIV transmission risks were reduced within stable partnerships between serodiscordant partners (where one partner is infected with HIV, and the other partner is not infected) by widespread use of highly active antiretroviral therapies (HAART), because of the reduced infectivity of those being treated. However, prolonged survival and improved quality of life for HIV-infected people resulted in a growing number of people living with HIV, and an increase in their sexual activity. Since the late 1990s, the change of HIV treatment strategies has led to treatment interruptions and delayed initiation of antiretroviral treatment in people newly diagnosed with HIV [DIAGRAM].

Therefore, by the early 2000s, increasing risk behaviour and increased transmission risk were no longer being compensated for by the effects of antiretroviral therapy. New infections with HIV increased in frequency in the partners of chronically HIV-infected people, and mostly in the age group in which most sexually active HIV-infected men are found (35-40 years). However, an increase in risk-taking behaviour by uninfected MSM and the formation of subpopulations of MSM with high partner numbers and a high prevalence of unsafe sexual behaviour introduced new opportunities for HIV to spread quickly and efficiently within high risk sexual networks, where high incidences of other STIs further enhanced the spread [17] [DIAGRAM]. These high risk networks are found within and across all age groups of MSM between the ages of 25 and 45-50. The diffusion of HIV from the core age group of 35-40 into the neighbouring age groups via sexual networks occurs with some

smaller time delays, which are reflected in the successive increase of HIV diagnoses incidence in different age groups [FIGURE 4].

Conclusions

The increase in number of partners in the early 1990s probably had few consequences for HIV incidence, because during that time period, an overwhelming proportion of penetrative sexual contacts within the context of casual sex were protected by condom use. A few exceptions may have permitted isolated infection clusters, but these did not spread extensively, because of widespread condom use. During this period, a comparatively high proportion of HIV transmission in MSM occurred within committed, short or long-term partnerships, and therefore increased emphasis on HIV testing was a highly appropriate part of prevention strategies.

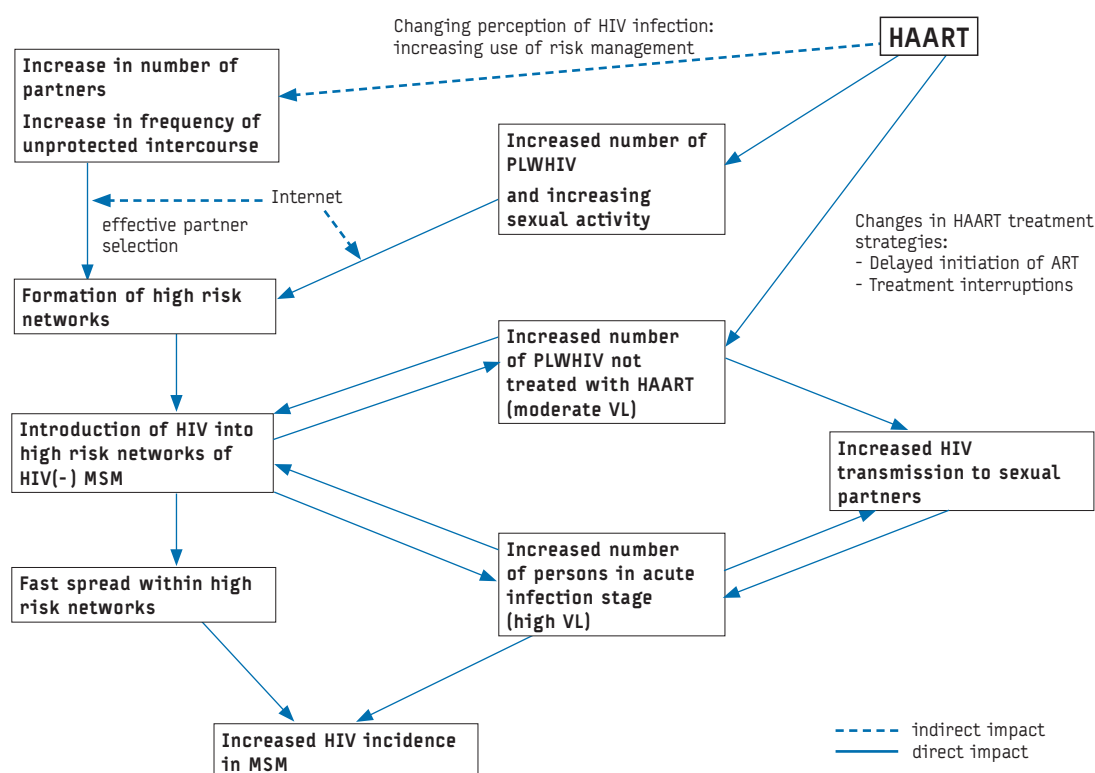
Risk minimisation strategies based on better knowledge or assumptions on HIV status developed during the 1990s and were appropriate for the above described epidemiological situation, but they tended to fail in the situation that developed after 1996, in which an increasing proportion of new infections are transmitted during acute HIV infection, and outside of stable partnerships. Emphasising HIV testing as a cornerstone of HIV prevention in the current situation in the mentioned high risk subgroups of MSM may even be counterproductive if it encourages men with a high number of partners and frequent practice of unsafe sex to be overly confident of a negative HIV status and to abandon condom use [17].

Outlook

While surveillance of newly diagnosed HIV infections allows for a more up to date monitoring of the HIV epidemic than AIDS case surveillance, it cannot provide accurate information on HIV incidence. The challenges are to apply methods to determine HIV incidence and

DIAGRAM

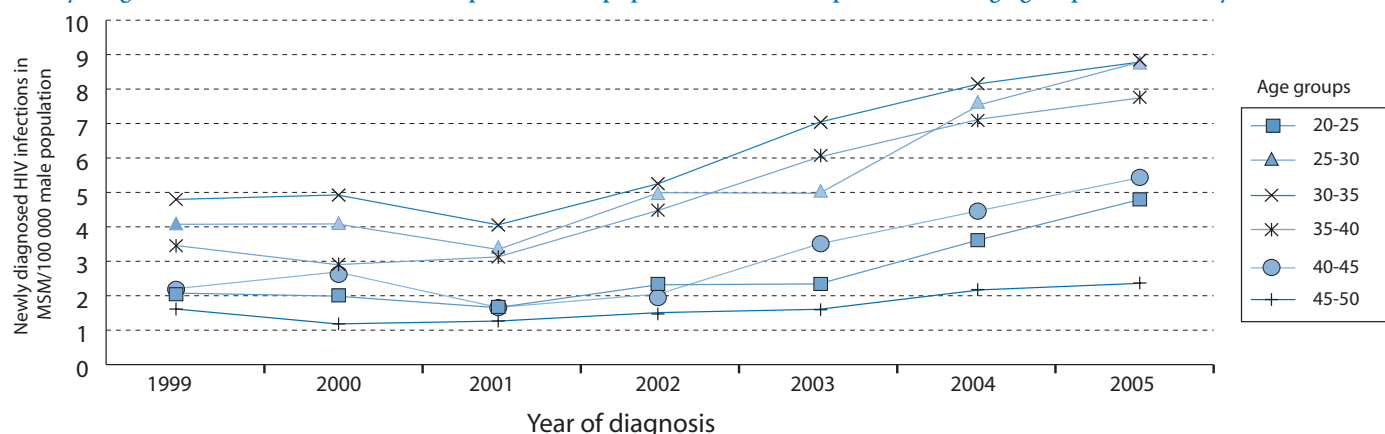
Behaviour and context factors leading to increased HIV incidence among MSM



PLWHIV = people living with HIV; VL = viral load; (HA)ART = (highly active) antiretroviral therapy

FIGURE 4

Newly diagnosed HIV infections in MSM per 100 000 population in the respective male age groups in Germany, 1999-2005



to monitor risk behaviour to detect changes in risk behaviours early enough to modify prevention messages and prevention strategies before these changes have a large impact on HIV incidence.

Our goal therefore is to build a system of second generation surveillance in Germany. Currently, the following elements of such a system are being implemented or planned:

- 1) A pilot study to establish a surveillance system and laboratory assays to define the proportion of recent infections among newly diagnosed HIV infections (ongoing).
- 2) Extension of behavioural surveillance of MSM. In addition to the repeated behavioural surveillance studies that have been conducted in the past and that focused on HIV-related risks, a new survey on MSM's knowledge, attitudes and behaviours regarding STIs has been executed in 2006. In a pilot sub-study within this survey we tested the feasibility of self-collected blood filter samples, with the aim of connecting behavioural and serological data (results are currently analyzed).
- 3) Qualitative research on risk factors of incident HIV infections and motives for unsafe sex in newly diagnosed HIV-infected MSM (ongoing).
- 4) A study on partner-seeking and risk communication by internet users (results are currently analyzed).

While we are aware that not all aspects of our proposed model are strongly corroborated by epidemiological and behavioural data, we think the model represents a reasonable interpretation of epidemiological trends based on available data, and as such, may be helpful for generating research questions for further studies.

References

1. RKI: HIV/AIDS-Eckdaten in Deutschland. <http://www.rki.de>
2. Macdonald N, Dougan S, McGarrigle CA, Baster K, Rice BD, Evans BG, Fenton KA. Recent trends in diagnoses of HIV and sexually transmitted infections in England and Wales among men who have sex with men. *Sex Transm Infect.* 2004;80:492-97.
3. Marcus U, Bremer V, Hamouda O, Kramer MH, Freiwald M, Jessen H, Rausch M, Reinhardt B, Rothaar A, Schmidt W, Zimmer Y, et al. Understanding recent increases in the incidence of sexually transmitted infections in men having sex with men: changes in risk behavior from risk avoidance to risk reduction. *Sex Transm Dis.* 2006;33(1):11-7.
4. Hamouda O: HIV/AIDS Surveillance in Germany. *J Acquir Immune Defic Syndr.* 2003;32 Suppl 1:S49-54.
5. Bochow M, Wright MT, Lange M: Schwule Männer und AIDS – Risikomanagement in Zeiten der sozialen Normalisierung einer Infektionskrankheit. *AIDS-Forum DAH*, Band 48. DAH, Berlin, 2004.
6. Gay Romeo: Sex Check '06 results (published on August 30, 2006). <http://www.gayromeo.com> (survey results only accessible for members)
7. Gebhardt M. Recent trends in new diagnoses of HIV infections in Switzerland: probable increase in MSM despite an overall decrease. *Euro Surveill* 2005;10(12):E051208.2. Available from: <http://www.eurosurveillance.org/ew/2005/051208.asp#2>
8. Hart GJ, Williamson LM. Increase in HIV sexual risk behaviour in homosexual men in Scotland, 1996-2002: prevention failure? *Sex Transm Infect.* 2005; 81(5):367-72.
9. Desquilbet L, Deveau C, Goujard C, Hubert J-B, Derouneau J, Meyer L, et al. Increase in at-risk sexual behaviour among HIV-1-infected patients followed in the French PRIMO cohort. *AIDS* 2002; 16(17):2329-33.
10. Dodds JP, Nardone A, Mercey DE, Johnson AM. Increase in high risk sexual behaviour among homosexual men, London 1996-8: cross sectional, questionnaire study. *BMJ.* 2000;320(7248):1510-1.
11. Prestage G, Van de Ven P, Mao L, Grulich A, Kippax S, Kaldor J. Contexts for last occasions of unprotected anal intercourse among HIV-negative gay men in Sydney: The health in men cohort. *AIDS Care.* 2005;17(1): 23-32.
12. Parsons JT, Schrimshaw EW, Wolitski RJ, Halkitis PN, Purcell DW, Hoff CC, Gomez CA. Sexual harm reduction practices of HIV-seropositive gay and bisexual men: serosorting, strategic positioning, and withdrawal before ejaculation. *AIDS.* 2005;19 (Suppl 1):S13-S25
13. Centers for Disease Control and Prevention (CDC). Increases in unsafe sex and rectal gonorrhea among men who have sex with men - San Francisco, California, 1994-1997. *MMWR Morb Mortal Wkly Rep.* 1999;48(3):45-8.
14. Smith AMA, Grierson J, Wain D, Pitts M, Pattison P. Associations between the sexual behaviour of men who have sex with men and the structure and composition of their social networks. *Sex Transm Infect.* 2004;80(6):455-8.
15. Clatts MC, Goldsamt LA, Yi H. An emerging HIV risk environment: a preliminary epidemiological profile of an MSM POZ Party in New York City. *Sex Transm Infect.* 2005;81(5): 373-6
16. Boily MC, Godin G, Hoggan M, Sherr L, Bastos FI. The impact of the transmission dynamics of the HIV/AIDS epidemic on sexual behaviour: a new hypothesis to explain recent increases in risk taking-behaviour among men who have sex with men. *Med Hypotheses.* 2005;65(2): 215-26.
17. Pao D, Fisher M, Hué S, Dean G, Murphy G, Cane PA, Sabin CA, Pillay D. Transmission of HIV-1 during primary infection: relationship to sexual risk and sexually transmitted infections. *AIDS.* 2005;19(1): 85-90
18. MacKellar DA, Valleroy LA, Secura GM, Bartholow BN, McFarland W, et al. Repeat HIV testing, risk behaviours, and HIV seroconversion among young men who have sex with men: a call to monitor and improve the practice of prevention. *J Acquir Immune Defic Syndr.* 2002 Jan 1;29(1):76-85.