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Trends in risk taking and risk reduction among German MSM: Results of follow-up surveys Gay men and AIDS 1991 - 2007

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**Trends in Risk Taking and Risk Reduction
Among German MSM**

Results of Follow-Up Surveys
“Gay Men and AIDS” 1991-2007

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Deutsche Kurzfassung

Hintergrund: In vielen europäischen Ländern hat die Zahl der HIV-Neudiagnosen in den letzten Jahren zugenommen. In Deutschland konnte ein solcher Trend beobachtet werden für die Gruppe der Männer, die Sex mit Männern haben (MSM). Während die Zahl der HIV-Neudiagnosen, die vom Robert-Koch-Institut ausgewiesen wird, sich in den Jahren 1993 bis 2000 bei etwa 700 Fällen jährlich bewegte, stieg diese Zahl auf 1.540 im Jahr 2007.

Häufig werden die steigenden HIV-Neudiagnosen in dieser Gruppe mit einer „zunehmenden Sorglosigkeit“ erklärt, die zu einer Abnahme der Kondomverwendung beim Analverkehr führe. Empirische Daten für eine solche Deutung lagen jedoch bislang nicht vor.

Tatsächlich ist weitgehend unklar, ob und in welchem Ausmaß die Zunahme der HIV-Neudiagnosen auf einer Änderung des Testverhaltens in dieser Gruppe beruht (wie es beispielsweise für Großbritannien gezeigt werden konnte), oder ob sich immer mehr schwule und bisexuelle Männer mit HIV infiziert haben. Dieser Bericht stellt die deutschsprachige Kurzfassung einer derzeit zur Publikation eingereichten umfassenderen Analyse dar.

Methodik: Seit 1991 werden in Deutschland im Auftrag der Bundeszentrale für gesundheitliche Aufklärung alle zwei bis drei Jahre Querschnitterhebungen bei schwulen und bisexuellen Männern durchgeführt. In einer sekundären Datenauswertung dienten diese sechs Studien als empirische Grundlage, um Verhaltenstrends bei MSM in Deutschland zu beschreiben. Verwendet wurden Daten aus vier Printbogen-Erhebungen (1991, 1993, 1996, 1999) sowie aus zwei Befragungen, für die Teilnehmer zusätzlich über das Internet gewonnen wurden (2003, 2007).

Insgesamt wurden 23.878 anonym und selbst auszufüllende Fragebögen mithilfe multivariater logistischer Regressionsanalysen ausgewertet; aufgrund der zwei verschiedenen Erhebungsmethoden getrennt für die Zeiträume 1991 bis 1999 und 2003 bis 2007. Dabei wurden jährliche *Odds Ratios* berechnet, die – kontrolliert für Alter, Bildung, Wohnortgröße und sexuelle Selbstbezeichnung – als Schätzer für zeitliche Trends verwendet werden können. Für den Zeitraum 2003 bis 2007 wurde zusätzlich für die Erhebungsmethode (*online* vs. *offline*) kontrolliert. Zur weiteren Minimierung von *Sampling*-Effekten wurden diese Trendanalysen nicht für das Gesamtsample, sondern für jeweils fünf Untergruppen durchgeführt: Zum einen wurde nach Alter und HIV-Serostatus stratifiziert: Nicht-positive 15- bis 24-Jährige, nicht-positive 25- bis 59-Jährige, positive 25- bis 59-Jährige. Zum anderen wurden zusätzlich MSM betrachtet, die mehr als zehn Sexpartner pro Jahr angeben und gleichzeitig mehrmals pro Monat schwule Saunen, Pornokinos, Sexclubs (Orte mit potentiell hoher Fluktuation der Sexualpartner) besuchen und somit unter epidemiologischen Gesichtspunkten als „Kerngruppen“ für die Ausbreitung sexuell übertragbarer Infektionen gelten können; sowie 25- bis 59-jährige MSM, die nicht oder nur selten „schwule Szene-Orte“ (einschließlich schwuler Cafés etc.) aufsuchen und daher als „szenefern“ bezeichnet werden.

Ergebnisse: Einhergehend mit der „Normalisierung“ von AIDS – Martin Dannecker spricht im Zusammenhang mit der Einführung nachhaltig wirksamer antiretroviraler Medikamente auch vom „Neuen AIDS“ – hat eine früher bedeutsame Risikovermeidungsstrategie schwuler und bisexueller Männer in Deutschland kaum noch eine Relevanz: die Beschränkung des Analverkehrs auf feste Partnerschaften. In allen Untergruppen ließen sich in beiden Zeiträumen signifikante jährliche Steigerungsraten derjenigen finden, die auch mit anderen Männern als dem festen Partner häufig oder regelmäßig Analverkehr praktizierten. Weniger stark ausgeprägt, aber ebenso durchgängig, war die Zunahme des häufigen oder regelmäßigen Analverkehrs mit dem festen Partner.

Andere Risikominderungsstrategien bei MSM in Deutschland zeigten eine hohe Zeitstabilität: Nach 2003 konnte in keiner Untergruppe eine Zunahme der Männer mit nicht-durchgängigem

Kondomgebrauch festgestellt werden, bis 1999 erfolgte ein solcher Anstieg lediglich in den „Kerngruppen“ und bei „szenefernen“ MSM. Entsprechendes gilt für die Anteile derer, die über Episoden ungeschützten Analverkehrs mit Sexpartnern berichteten, deren HIV-Serostatus ihnen unbekannt (oder diskordant) war. Für keine Untergruppe ließ sich eine Zunahme des Anteils derer beobachten, die Kondome als „störend beim Sex“ empfinden. Umgekehrt stieg der Anteil derer, die Kondome als „nicht-störend beim Sex“ betrachten, in den meisten Untergruppen deutlich an – außer in „Kerngruppen“ und bei HIV-Positiven.

Die beschriebene Zunahme des Analverkehrs innerhalb und außerhalb fester Partnerschaften wurde nicht von einer entsprechenden Zunahme des Gebrauchs inhalativer Nitrate („Poppers“) begleitet, obwohl diese bei einem erheblichen Anteil schwuler und bisexueller Männer beim Analverkehr verwendet wurden. Zwischen 1996 und 1999 ließ sich eine leichte Zunahme des Gebrauchs von „Partydrogen“ (Ecstasy, Speed/Amphetamine/Crystal, LSD/Ketamin, Kokain) beobachten; dieser Trend war jedoch nicht in allen Untergruppen vorhanden bzw. nach 2003 wieder rückläufig.

Die Zahl der Sexualpartner bei MSM in Deutschland blieb zwischen 1991 und 2007 eher stabil. Mitte der 1990er Jahre nahm der Anteil derer, die für die vorangegangenen zwölf Monate mehr als zehn bzw. mehr als zwanzig Sexualpartner angeben, leicht zu, um zwischen 2003 und 2007 wieder zu sinken. Dabei ist hervorzuheben, dass der Anstieg in die Zeit *vor* der Verbreitung des Internets fiel und somit nicht auf *online-dating* zurückzuführen ist, sondern – ähnlich der Zunahme des Analverkehrs – eher auf die „Normalisierung“ von AIDS verweist, möglicherweise auch auf eine gewisse „Re-Normalisierung“ schwuler Sexualität.

Für die Validität der hier gezeigten Trendanalysen spricht, dass die Syphilis-Epidemie bei schwulen Männern, die vor allem in den deutschen Metropolen nach 1999 stattfand, sich in den vorliegenden Survey-Daten widerspiegelt. Erhebliche Anstiege fanden sich in allen Untergruppen zwischen 2003 und 2007 (in den „Kerngruppen“ hat dieser Anstieg vermutlich bereits vorher stattgefunden und war nach 2003 daher nicht mehr als Steigerung sichtbar). Kein entsprechender Anstieg ließ sich für die urethrale Gonorrhö feststellen, obgleich aufgrund des hohen Bekanntheitsgrades des „Trippers“ und der Seltenheit asymptomatischer Verläufe kaum von einer Untererfassung auszugehen ist.

In allen untersuchten Untergruppen konnten signifikante Zunahmen kürzlich durchgeführter HIV-Tests festgestellt werden, die sich in all diesen Gruppen auch nach 2003 nicht nur fortsetzen, sondern weiter verstärken. Besonders ausgeprägt war dies bei „Kerngruppen“ (Zunahme der Testfrequenz) sowie bei unter 25-jährigen und „szenefernen“ MSM (Ausweitung des Testens). Es zeigte sich somit auch bei MSM in Deutschland ein breiter und fortgesetzter Anstieg des HIV-Testverhaltens.

Schlussfolgerungen: Wir fanden keine Hinweise für zunehmende „Sorglosigkeit“, „Präventions“- oder „Kondommüdigkeit“ bei MSM in Deutschland. In Anbetracht der fortgesetzten deutlichen Zunahme der Frequenz anal-genitaler Kontakte, insbesondere mit nicht-festen und daher häufig weniger gut bekannten Sexualpartnern, muss auch bei relativ konstanter Kondomverwendung von einer Zunahme der HIV-Inzidenz ausgegangen werden, die jedoch nicht wesentlich auf eine Erosion des Kondomgebrauchs zurückzuführen ist. Vielmehr wird durch den zusätzlichen Einbruch einer Syphilisepidemie in eine ohnehin für STI vulnerable Population die pro-Kontakt-Wahrscheinlichkeit einer HIV-Übertragung zusätzlich erhöht.

Die hier vorgestellten zeitlichen Trendanalysen, die auf großen bundesweit erhobenen empirischen Verhaltensdatensätzen basieren, zeigen jedoch ebenfalls, dass der Anstieg der HIV-Neudiagnosen bei MSM in Deutschland zu einem nicht unerheblichen Anteil auch eine Ausweitung des Testverhaltens widerspiegeln: Sowohl ein vermehrtes Testen bei MSM, die bei sexuellen Kontakten vergleichsweise hohe Risiken eingehen, als auch eine Ausweitung des Testens bei denen, die wenig Kontakt zur schwulen Szene haben.

Abstract

Objectives: To calculate estimates for group level trends among German men who have sex with men (MSM) regarding parameters related to HIV epidemiology: frequency of anal intercourse, consistency in condom use, risk-taking, numbers of sex partners, incident bacterial STIs, and HIV-testing behaviour.

Methods: Data derived from six large cross-sectional national follow-up surveys among MSM, conducted between 1991 and 2007. Questionnaires were circulated with German magazines for gay men; in 2003/2007, online recruitment was added. 23,878 anonymously self-administered questionnaires were analyzed in multiple regression models for five subgroups.

Results: With the normalization of AIDS, restriction of anal intercourse to primary partnerships has lost its relevance as a risk avoidance strategy for MSM. Other traditional risk reduction strategies among MSM in Germany showed a high degree of time stability: Between 1991 and 2007, condom use in anal intercourse has been relatively stable; numbers of sex partners have been rather constant. No positive trends in the use of Nitrite inhalants were seen, party drugs were increasingly used by a minority of gay men during the 1990s. The syphilis epidemic seen after 1999 among German gay men is well reflected in the survey data. No evidence was found for a concurrent rise in urethral gonorrhoea. The proportion of MSM with a recent HIV test has been continuously increasing.

Conclusions: We found no evidence for increasing 'carelessness' or 'prevention fatigue'. However, given the increasing proportions of MSM who frequently engage in anal intercourse with casual partners, a rise in HIV incidence is likely; especially if accompanied by a syphilis epidemic. Time trend analyses of these large behavioural follow-up surveys suggest that the rise in new HIV diagnoses among MSM in Germany may partially reflect an increased uptake of HIV-testing, rather than new infections due to the erosion of condom use or increased numbers of sex partners.

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Objective

What are the most important group level trends among German men who have sex with men (MSM) regarding behavioural parameters related to an increased chance of transmission of human immunodeficiency virus (HIV), an increased risk of infection with HIV, or an increased chance of being tested positive for HIV antibodies? To answer this question, we calculated estimates for such trends using data from six large cross-sectional national follow-up surveys conducted between 1991 and 2007.

Introduction

Recent increases in HIV diagnoses among men who have sex with men (MSM) have been documented in many post-industrialized countries [1]; e.g. the US [2], Australia [3], and Western European Countries like the UK, Denmark, Finland, Switzerland, Belgium, and Germany [4]. In Germany, new HIV diagnoses among MSM were rather stable between 1993 and 2000, with an average count of roughly 700 confirmed positive HIV antibody tests per year. Following the introduction of a new surveillance system in 2001 [5], this number has been increasing, resulting in 870 newly diagnosed HIV-positive MSM in 2003, and 1,540 in 2007 [6].

Researchers from the UK have suggested that the rise in newly diagnosed HIV infections in the United Kingdom may reflect an increased uptake in HIV testing rather than a rise in HIV incidence [7]. In Germany, empirical data on performed antibody negative HIV tests among MSM are lacking. Therefore, even if recent infections would routinely be distinguished from long standing infections by serological methods [8], and even if valid estimates for regional MSM population sizes were available [9], information on the denominator – the number of MSM tested yearly for HIV – would still remain crucial for calculating MSM-specific HIV incidences.

Researchers from Germany, assuming that HIV incidence among MSM in Germany may well be increasing, have recently proposed a model to describe factors influencing infection dynamics [10], underlining the role of ‘*community viral load*’ (this term, though controversial, was introduced because HIV-*prevalence* refers to persons who are positive for HIV antibodies; and thus to subjects that might not be sexually contagious, for example because of effective antiretroviral treatment [11]). In this model, the main factors associated with increasing HIV transmissions among MSM are rising numbers of sex partners, increasing anogenital contacts, declining use of condoms in anal intercourse, an increasing proportion of MSM living with HIV, and a delay in prescribing antiretroviral treatment (ART) – all resulting in increased community viral load. These changes, however, may at least partly be compensated by a repertoire of evolving individual risk reductions strategies – like serosorting [12, 13] – or by a rising proportion of MSM on ART with effectively suppressed viral replication, whose sexual infectivity is drastically reduced [11].

Sexually transmitted infections (STIs) – and more seriously, early stage HIV infection (especially before seroconversion) – amplify per-contact-infectivity. There is an ongoing debate about which of the two has the larger impact on HIV incidence [14]. In Germany, after the introduction of a new infectious disease legislation in 2001, syphilis remains the only notifiable bacterial STI (i.e. the laboratory has to anonymously report every diagnosed syphilis to the Robert Koch Institute, while for example Chlamydia infections and gonorrhoea, since 2001, have been surveyed through a sentinel system: [15]). Syphilis infections attributable to homosexual contacts have been rising from less than 600 diagnosed infections in 2001 up to more than 1.700 in 2004, 2005, and 2006 [16].

Behavioural data and data on self reported STIs are not routinely linked to German HIV or Syphilis notification data. However, on behalf of the Federal Centre for Health Education (BZgA), follow up surveys on knowledge, attitudes and behaviour among MSM in Germany –

called '*Gay men and AIDS*' (GMA) – have been conducted every two or three years since 1991, providing an empirical basis for trend analyses. This is the first attempt to estimate trends in risk-taking, risk reduction, and risk-avoiding strategies among MSM in Germany, as well as trends in bacterial STIs and HIV testing from empirical behavioural data.

Methods

Participants

Six cross sectional studies were conducted in November 1991 (n=3,417), December 1993 (n=2,941), July 1996 (n=3,048), November 1999 (n=2,995), February 2003 (n=4,750), and May 2007 (n=8,170); taken together, data for of 25,321 respondents were analyzed. In the 1990s, the questionnaire was distributed with magazines for gay men; in 2003 and 2007, Internet recruitment was added. Compared with recruitment through the 'gay press', the spectrum of MSM who can be reached by linking an online questionnaire to chat rooms for MSM is much broader. Although a middle class bias is still existent, online participants are much more likely to be younger, to belong to lower social classes, to live in non-metropolitan areas, to be rather disconnected from the 'gay scene', or to self-identify indirectly as MSM but not explicitly as 'gay'. Since introduction of online recruitment, online participation has been rising: 52 per cent of study participants were recruited online in 2003, and 76 per cent in 2007.

Questionnaire

Participants completed a 70-item anonymous, self-administered questionnaire covering a broad range of topics including: socio-demographic data, sexual identity, sources of information on HIV/AIDS, lifestyle (e.g. partnership, coming-out, drug use), sexual lifestyle (e.g. number of sex partners, sexual practices with primary and casual partners, frequency of protected and unprotected anal intercourse, ingestion of seminal fluid), prior sexually transmitted infections (STIs), HIV testing behaviour, and HIV serostatus.

Measures

All outcome measures for the analysis are dichotomized. Men were asked about the number of male sex partners in the last twelve months; the proportion of men with more than 20 partners was chosen as the dichotomous outcome. Men were asked if they had insertive or receptive anal intercourse with primary or casual partners, and for each type of anal intercourse, frequency was queried as 'never', 'sporadically', 'frequently', or '(almost) always'. The proportion of men who frequently or almost always engaged in anal intercourse (when having sex with a man in the last twelve months) was chosen as the outcome variable. Given that this was a self-administered, anonymous survey, the concepts of 'primary' and 'casual' partner were necessarily self-defined, but were clearly separated in the questionnaire as different categories of sex partners.

Condom use was asked separately for primary and casual partners; its frequency was categorized as 'never', 'sporadically', 'frequently', or 'always'. Inconsistent condom use was defined as anything but 'always'. Men were asked if they had been tested for HIV antibodies (never, once, twice, or more than twice), and about the year of their latest test, and the test result. An HIV antibody test was considered as recent, if the last test was in the same year as the study or the year before, thus spanning a time frame between 18 to 23 months (1991-1999), or 14 and 16 months (2003 and 2007). Regarding other sexually transmitted infections, men were asked if they had been diagnosed with genital or anorectal gonorrhoea or with syphilis in the last 12 months.

Consumption of recreational drugs was queried as well: 'never', 'one or two times', 'sporadically', 'frequently', or 'regularly' in the last twelve months. Men were labelled consumers of recreational drugs if they had taken the respective substance at least sporadically. Ecstasy, speed/amphetamines/crystal, LSD/ketamine, and cocaine were subsumed under party drugs.

To measure condom acceptance or so-called *condom fatigue*, men were asked for agreement (fully, partly, or not at all) to the statement that condoms are disturbing during sexual intercourse. Risk taking was defined as at least one episode of unprotected anal intercourse (UAI) in the last twelve months with a sex partner of unknown (or serodiscordant) HIV serostatus (regardless if sex partners were steady or casual), or who have 'frequently' orally received seminal fluid of casual sex partners (or, if respondents were HIV positive, if they have 'frequently' ejaculated into casual sex partners' mouths). We are aware that for people who live with HIV, the term 'risk taking' is not entirely appropriate and should better be labelled as 'potentially putting others at risk for HIV'; however, for more convenience, the term 'risk taking' is used regardless of HIV serostatus.

Data Analysis

The use of cross-sectional data for trend analyses is limited: a representative census of MSM is impossible as random samples of this 'hidden' population cannot be drawn [17]. In addition, the sampling strategy for this follow-up survey was altered in 2003, when online questionnaires were introduced. Exclusion of online participants would have limited the power of trend analyses. As the socio-demographic composition of offline participants has shifted substantially over time towards men living in metropolitan areas and frequent visitors to locations of the *gay scene*, selection bias would still have been present. Therefore, the periods 1991-1999 (offline participants only) and 2003-2007 (online and offline participants) were analyzed separately.

To increase validity of the trajectories, five subgroups were constructed:

Men potentially at risk for HIV infection (whose last test was negative or who were never tested for HIV antibodies) were divided by age group: 15-24 years of age (referred to as *young* or subgroup 1), and 25-59 years of age (*main group* or subgroup 2). MSM reporting to be HIV positive were analyzed separately (*HIV-positive* or sub-group 3). To keep this group as large as possible, HIV-positive men were not further divided by age (only 3.6 per cent out of 1,928 HIV-positive respondents were younger than 25). Respondents with more than 10 sex partners in the last twelve months, who at least several times per month have visited gay saunas, porn cinemas, or leather bars or clubs, are regarded as a proxy for '*core groups*' [18], among which HIV and other STIs are spread rather fast due to a high degree of sex partner fluctuation (*core groups* or subgroup 4). As a contrast to this *core group*, respondents who never or only sporadically have visited gay venues (including gay book stores, cafés and other non-sexual venues), are regarded as a non-scene-using MSM subgroup (*non-scene* or subgroup 5). To enhance comparability with subgroup 4, subgroup 5 was restricted to men aged 25 to 59 years (like subgroup 2). Subgroup 5 comprises – among others – gay men and other MSM who find sex partners online; at least after 1999, when sex partner recruitment via Internet became increasingly popular. It should be noted that subgroups 1-3 exclude each other, as do subgroups 4-5; while subgroups 1-3 overlap with subgroups 4-5.

Respondents were asked whether or not they had participated in one of the previous follow-up surveys. However, irrespective of the generated bias, the construction of subgroup consisting only of respondents who repeatedly participated in the survey would not have led to a longitudinal control group, as previous participation does not imply participation in all follow-up surveys.

Because of different time lapses between the surveys, calendar year was taken as an independent variable in logistic regression models for each subgroup and each outcome variable. Odds Ratios (per year) and 95 percent confidence intervals were calculated using SPSS 16. In all regression models, to control for and reduce sampling bias, adjustments were made for age

(above the group-specific median age or below), education (12 years of schooling or less, i.e.: general qualification for university or not), city size (more than 500,000 inhabitants or less), sexual identity (self identification as ‘gay/homosexual’ or not), and sampling approach (offline or online recruitment). Steadiness of the average trends was confirmed by contrasting each assessment point to preceding assessment points.

Results

Subgroups

Altogether, 25,321 survey questionnaires were completed between 1991 and 2007. Of those, 23,878 questionnaires were analysed in subgroups 1, 2, and 3, and 11,960 questionnaires in subgroups 4 and 5. The numbers of participants for each survey year and the median age in the respective subgroups are displayed in **Table 1**. Internet recruitment, started in 2003, has led to a sharp rise in the absolute number of participating MSM, especially among *young* respondents (subgroup 1) and among MSM who do not frequently visit places or venues for gay men (subgroup 5). The proportion of respondents who report to have participated in a previous GMA survey was 27 per cent on average (data not shown); relatively stable in the *main group* (subgroup 2: 30%), among *HIV-positive* respondents (subgroup 3: 38%) or core groups (subgroup 4: 39%); or – as expected – declining after the introduction of internet recruitment among *non-scene* respondents (subgroup 5: 27%) or *young* respondents (subgroup 1: 8%). The latter proportion is substantially lower than the others, because in case of repeated participation they would switch into subgroup 2 when reaching the age of 25 years.

Table 1: Number of participants per year and subgroup and median age in each subgroup

	1991	1993	1996	1999	2003	2007	all	median age	mean age
<i>Young (HIV-neg./untested)</i>	541	422	269	276	1,162	1,997	4,667	21	20.9
<i>Main (HIV-neg./untested)</i>	2,481	2,135	2,376	2,167	2,898	5,226	17,283	35	36.3
<i>HIV-positive</i>	211	196	228	345	387	561	1,928	38	39.1
<i>Core groups</i>	333	400	547	628	652	578	3,138	36	37.2
<i>Non-scene</i>	1,202	918	843	848	1,351	3,660	8,822	37	37.8

The composition of the sample has changed significantly over time. The construction of the five subgroups has substantially lowered, but not eliminated this effect: While *young* respondents (subgroup 1) have become younger on average after introduction of Internet recruitment, the proportion of MSM above the median age has continuously increased over time in all other subgroups (**Table 2**). Internet recruitment has further introduced lower proportions of MSM who qualify for university access, who self-identify as gay or homosexual, or who live in metropolitan areas (defined as cities with more than 500,000 inhabitants: Berlin, Hamburg, Munich, Cologne, Frankfurt am Main, Stuttgart, Dortmund, Essen, Düsseldorf, Bremen, Hanover, Leipzig, Dresden, Nuremberg, Duisburg). It is noteworthy however that among *core group* participants – comprising 13 per cent of the complete sample – who report a previous HIV test, the proportion of *HIV-positive* men is very robust, ranging from 21.5 to 23.4 per cent (data not shown).

Table 2: Distribution of control variables per year and subgroup

Age (proportion above the median age*)	1991	1993	1996	1999	2003	2007	all
<i>Young (HIV-neg./untested)</i> *22 years or older	82.1	84.6	81.0	75.7	58.7	42.4	59.2
<i>Main (HIV-neg./untested)</i> *35 years or older	36.9	35.8	43.8	50.2	54.0	64.4	50.6
<i>HIV-positive</i> *39 years or older	24.6	31.1	33.3	44.9	55.3	66.8	48.4
<i>Core groups</i> *37 years or older	25.8	25.0	38.9	42.7	58.6	66.6	45.7
<i>Non-scene</i> *37 years or older	39.8	38.1	43.9	52.1	48.1	59.9	50.8
Education (proportion with 12 years or more of schooling)							
				(%)			
<i>Young (HIV-negative/untested)</i>	58.2	67.8	61.2	67.4	59.1	59.8	60.7
<i>Main (HIV-negative/untested)</i>	65.3	71.3	67.6	70.1	68.9	58.2	65.4
<i>HIV-positive</i>	58.3	55.6	48.7	56.8	56.1	51.2	54.1
<i>Core groups</i>	69.1	72.0	68.2	69.9	64.3	60.4	66.9
<i>Non-scene</i>	60.2	65.8	58.8	61.4	64.1	54.2	58.9
City size (proportion residing in cities with 500,000 inhabitants or more)							
				(%)			
<i>Young (HIV-negative/untested)</i>	43.1	44.3	46.5	52.2	28.8	20.9	30.9
<i>Main (HIV-negative/untested)</i>	51.2	56.1	59.2	59.7	51.5	39.8	50.6
<i>HIV-positive</i>	68.7	69.9	73.7	72.5	67.4	62.4	68.0
<i>Core groups</i>	69.4	70.5	72.6	67.7	63.8	51.9	65.4
<i>Non-scene</i>	40.9	44.4	43.4	49.8	40.7	34.9	39.9
Sexual identity (proportion self-identifying as gay/homosexual)							
				(%)			
<i>Young (HIV-negative/untested)</i>	89.1	89.6	90.3	89.1	83.0	82.0	84.7
<i>Main (HIV-negative/untested)</i>	88.9	89.7	90.1	91.5	86.6	85.0	87.9
<i>HIV-positive</i>	94.8	95.9	94.7	91.0	91.5	93.4	93.2
<i>Core groups</i>	92.5	94.8	91.8	93.5	87.6	87.7	90.9
<i>Non-scene</i>	85.9	87.1	86.8	87.5	82.6	83.7	84.9
Recruitment (proportion recruited offline via print questionnaires)							
				(%)			
<i>Young (HIV-negative/untested)</i>	100.0	100.0	100.0	100.0	13.0	6.4	38.3
<i>Main (HIV-negative/untested)</i>	100.0	100.0	100.0	100.0	56.8	27.4	70.8
<i>HIV-positive</i>	100.0	100.0	100.0	100.0	71.3	49.0	79.4
<i>Core groups</i>	100.0	100.0	100.0	100.0	76.1	44.6	84.8
<i>Non-scene</i>	100.0	100.0	100.0	100.0	43.5	21.3	58.7

Anal Intercourse and Condom Use with Primary and Casual Partners

Since 1991, about half of the respondents in all subgroups have reported to have a primary male partner (subgroup 1: 45%, subgroup 2: 55%, subgroup 3: 50%, subgroup 4: 46%, subgroup 5: 58%). This percentage is one of the most robust observed over time in the GMA-studies: regarding steady partnerships, no trends can be observed in any subgroup.

The proportion of respondents who frequently engage in anal intercourse (AI) with primary partners has been rising since 1991, especially among *HIV-positive* and *young* respondents between 2003 and 2007 (Table 3). In the years of the ‘AIDS shock’ – during the second half of the 1980s – AI was often completely avoided or restricted to primary partnerships [19, 20]. This can be illustrated by looking at the *main group* (subgroup 2: comprising all participants aged 25 to 59 whose last HIV test was antibody negative or who were untested for HIV): While in 1991 only 12 per cent reported frequent AI with casual partners and 35 per cent with primary partners; the respective proportions have risen to 39 per cent (casual partners) and 52 per cent (primary partners). Since 1993, in all subgroups, the proportions of respondents who engage in AI with casual partners are approximating the proportions of those who engage in AI with primary partners; the trends for AI with casual partners are much stronger compared with AI with primary partners. Noticeably, this ‘re-normalization’ of anal intercourse – both with primary and casual partners – sets in as soon as 1993, and hence *before*, not after medicalization with antiretrovirals.

Table 3: Respondents engaging in anal intercourse (frequently or always) with primary/casual partners (among those with primary/casual partners within the twelve months preceding the respective survey)

	1991	1993	1996	1999	2003	2007	adj. OR*	95%- CI	p	adj. OR*	95%- CI	p		
Primary partners								(1991-1999)			(2003-2007)			
	(%)													
<i>Young (HIV-neg./?)</i>	37.6	37.3	45.4	46.9	46.3	56.9	1.063	1.020	1.107	0.003	1.128	1.079	1.180	<0.001
<i>Main (HIV-neg./?)</i>	34.6	38.4	42.0	43.8	47.3	51.6	1.054	1.036	1.072	<0.001	1.036	1.006	1.067	0.018
<i>HIV-positive</i>	45.9	49.1	43.9	49.4	50.2	64.8	1.014	0.964	1.066	0.586	1.138	1.039	1.246	0.005
<i>Core groups</i>	38.3	41.7	45.9	48.8	46.3	53.4	1.066	1.024	1.110	0.002	1.069	0.985	1.159	0.109
<i>Non-scene</i>	31.6	38.0	38.7	40.3	46.8	51.9	1.045	1.018	1.072	0.001	1.046	1.005	1.088	0.027
Casual partners								(1991-1999)			(2003-2007)			
	(%)													
<i>Young (HIV-neg./?)</i>	14.7	20.6	20.5	27.7	33.3	42.0	1.093	1.044	1.144	<0.001	1.109	1.056	1.165	<0.001
<i>Main (HIV-neg./?)</i>	12.2	19.3	18.8	26.1	32.8	39.1	1.110	1.088	1.131	<0.001	1.060	1.030	1.092	<0.001
<i>HIV-positive</i>	28.5	44.0	34.4	45.3	52.0	58.5	1.076	1.029	1.125	0.001	1.094	1.016	1.178	0.017
<i>Core groups</i>	25.9	29.3	27.0	39.0	45.5	57.9	1.081	1.045	1.118	<0.001	1.119	1.051	1.191	<0.001
<i>Non-scene</i>	10.9	18.3	16.8	20.9	29.3	37.9	1.089	1.054	1.126	<0.001	1.097	1.050	1.145	<0.001

*Odds Ratios are adjusted for age, education, city size, and sexual identity (1991-99, 2003-07), and for Internet recruitment (2003-07).

Inconsistent condom use is common in anal intercourse with primary, but much less with casual partners (Table 4). *HIV-positive* respondents (and *core groups*, who harbour a high proportion of HIV-positive MSM) are less likely to report inconsistent condom use with primary partners than other subgroups, whereas with casual partners, this is reversed. While the trend towards more anal intercourse can be seen in both time frames and among all subgroups, condom use has been rather stable, noticeably with casual partners. A significant trend towards inconsistent condom use with casual partners can be seen among *core groups* and *HIV-positive* respondents between 1993 and 1996, but not between 2003 and 2007. Less consistent condom use, however, does not necessarily reflect more exposure to HIV. It could as well indicate an increase in communication about HIV serostatus, resulting in increasing serosorting with casual partners (especially among *HIV-positive* respondents) or negotiated safety with primary partners.

Therefore, *risk taking* was defined as at least one episode of unprotected anal intercourse (UAI) in the last twelve months with a sex partner of unknown (or serodiscordant) HIV serostatus (for more details see *Measures*). Among *core groups* and *HIV-positive* respondents, a substantial shift towards more risk taking can be observed between 1996 and 1999; after that, the proportion of *HIV-positive* or *core group* participants with at least one episode of UAI with a partner of unknown (or serodiscordant) HIV serostatus levels off at about fifty per cent. The proportion of *risk takers* among *core groups* increased from 31.4 per cent in 1991 to 51.5 per cent in 2007, and the

respective proportion among of *HIV-positives* from 36.8 per cent in 1999 to 49.9 per cent in 2007. By contrast, in the HIV-negative/untested subgroups 1 and 2, the proportions of *risk takers* are highly stable at 32 and 26 per cent; or 25 per cent among *non-scene* respondents; thus in the larger subgroups no increase in *risk taking* can be seen.

Table 4: Inconsistent condom use with primary or casual partners (among those who engage in anal intercourse with primary/casual partners) and respondents who can be described as ‘risk takers’ regarding HIV transmission

	1991	1993	1996	1999	2003	2007	adj. OR*	95%- CI (1993-1999)		p	adj. OR*	95%- CI (2003-2007)		p
Primary partners														
				(%)										
<i>Young (HIV-neg./?)</i>		53.6	56.7	66.5	61.9	65.6	1.099	1.026	1.176	0.007	1.051	0.998	1.106	0.060
<i>Main (HIV-neg./?)</i>		60.7	61.5	64.6	66.8	71.6	1.023	0.995	1.052	0.114	1.053	1.016	1.091	0.005
<i>HIV-positive</i>		51.1	44.3	45.4	54.9	64.8	0.975	0.896	1.062	0.564	1.109	0.998	1.232	0.055
<i>Core groups</i>		46.4	52.5	54.2	64.1	70.3	1.052	0.988	1.120	0.112	1.069	0.966	1.182	0.196
<i>Non-scene</i>		68.6	70.8	68.4	71.2	73.2	0.994	0.949	1.041	0.807	1.027	0.976	1.080	0.302
Casual partners														
				(%)										
<i>Young (HIV-neg./?)</i>		20.8	23.4	26.2	30.2	29.8	1.051	0.967	1.143	0.242	0.985	0.925	1.049	0.643
<i>Main (HIV-neg./?)</i>		20.0	17.1	22.6	27.2	27.0	1.031	0.994	1.069	0.097	0.971	0.934	1.008	0.125
<i>HIV-positive</i>		33.1	43.8	45.1	61.9	62.5	1.091	1.012	1.176	0.023	1.025	0.943	1.115	0.565
<i>Core groups</i>		23.9	24.7	35.4	46.3	46.7	1.107	1.049	1.169	<0.001	0.972	0.908	1.040	0.413
<i>Non-scene</i>		23.1	20.0	19.8	27.0	30.0	0.968	0.906	1.034	0.328	1.025	0.969	1.084	0.397
Risk takers														
				(%)										
<i>Young (HIV-neg./?)</i>	31.6	27.8	26.5	37.7	34.5	35.8	1.027	0.989	1.066	0.162	1.011	0.972	1.051	0.582
<i>Main (HIV-neg./?)</i>	27.7	23.3	22.9	26.4	29.9	26.0	0.996	0.981	1.013	0.666	0.949	0.924	0.975	<0.001
<i>HIV-positive</i>	36.8	31.8	37.3	44.6	53.8	49.9	1.073	1.028	1.120	0.001	0.992	0.926	1.063	0.822
<i>Core groups</i>	31.4	30.5	31.4	44.7	48.6	51.5	1.091	1.056	1.127	<0.001	1.012	0.952	1.077	0.700
<i>Non-scene</i>	29.1	22.0	22.6	23.7	27.6	25.0	0.970	0.946	0.994	0.016	0.967	0.932	1.003	0.071

*Odds Ratios are adjusted for age, education, city size, and sexual identity (1991-99, 2003-07), and for Internet recruitment (2003-07).

Among respondents engaging in anal intercourse, no positive trend was found in any subgroup regarding condoms to be perceived as ‘disturbing’, neither between 1993 and 1999, nor between 2003 and 2007 (data not shown). By contrast, a negative trend could be seen between 2003 and 2007 among *young* respondents (subgroup 1; OR=0.901, p=0.011) and in the *main group* (subgroup 2; OR=0.947, p=0.016). The proportions of respondents who felt condoms were ‘disturbing’ ranged from 14 per cent (subgroup 1), or 18 per cent (subgroup 2) to 28 per cent (subgroup 3). Non-scene respondents (subgroup 5; 18 per cent) were more likely to report condom aversion than respondents closely connected to the gay scene.

For the opposite perception – condoms to be ‘non-disturbing’, significant positive trends could be seen in the same subgroups (subgroup 1, 2003-2007: OR=1.116, p=0.001; subgroup 2, 1993-1999: OR=1.107; p<0.001; subgroup 2, 2003-2007: OR=1.080, p<0.001), and among non-scene respondents (subgroup 5, 1993-1999: OR=1.079, p<0.022; 2003-2007: OR=1.063, p<0.030). In 2007, the proportions of respondents who explicitly disagreed with the notion that condoms would be ‘disturbing’ ranged from 23 per cent (subgroup 3) to 36 per cent (subgroup 1). The increase regarding the use of condoms as non-disturbing contradicts the frequently stated position of a generalized growing ‘condom fatigue’ [21] among MSM. In our large datasets, empirical evidence for this notion is lacking.

Numbers of Sex Partners and Sexually Transmitted Infections

The number of sex partners among MSM in Germany has been rather stable during the last seventeen years. During the 1990s, the proportion of respondents with more than ten (data not shown), or more than twenty sex partners per year (Table 5) slightly increased; this trend, however, is most pronounced among subgroups with rather low averaged numbers of sex partners (subgroups 2 and 5). Between 2003 and 2007, numbers of sex partners have stabilized, if not reversed. *HIV-positive* respondents report higher partner numbers than HIV-negative (or untested) respondents of the same age group. More than two thirds of *core group* participants (subgroup 4), who by definition have more than ten partners per year, report more than twenty sex partners per year; while among *non-scene* respondents (subgroup 5), less than ten per cent do so.

High numbers of sex partners are usually positively correlated with sexually transmitted infections (STIs). Especially STIs that can be easily passed on during sexual contacts – like gonorrhoea – can be used as an indicator for a high degree of partner fluctuation in group level analyses. The proportion of respondents who report to have been diagnosed with urethral gonorrhoea in the last twelve months has been very stable at about three per cent in the *main group* (subgroup 2). The only significant increase can be seen among *HIV-positive* respondents between 2003 and 2007. *Core group* participants display much higher rates of urethral gonorrhoea than *non-scene* respondents. Given the widespread knowledge about symptoms of urethral gonorrhoea and its high probability of symptomatic early onset (pain, urethral discharge), under-reporting of urethral gonorrhoea is very unlikely.

Anal gonorrhoea or syphilis, however, have clinical onsets that can easily be overlooked by the carrier and therefore are more likely to be underdiagnosed (and thus underreported) if not routinely screened for. In Germany, routine screening for syphilis is only recommended and reimbursed for HIV-positive MSM, while screening for anal gonorrhoea is not reimbursed at all.

Between 1991 and 1999, in all subgroups, syphilis was less frequently reported than urethral gonorrhoea: The proportions were less than one per cent in subgroups 1 and 2 (i.e. among *young* respondents and in the *main group*), less than three per cent among *HIV-positive* respondents, and less than two per cent among *core group* participants. After 1999, a steep increase can be seen in subgroups 2, 3, 4, and 5. The tripling of syphilis diagnoses reported from Germany laboratories between 2001 and 2004 in the national notification system has its parallel in the tripling of self-reported syphilis diagnoses between the GMA surveys of 1999 and 2003 – not only among *HIV-positive* respondents (rising from 2.6% to 8.2%) and *core group* participants (rising from 1.8% to 5.1%), but also among *non-scene* respondents (rising from 0.4% to 1.2%).

Remarkably, while the proportion of *core group* participants seems to level off at about five per cent in 2003, syphilis diagnoses are still rising after 2003 in subgroups 2 and 5 (*main group* and *non-scene*). Compared with 1991, the odds for *HIV-positive* respondents to self-report a recent syphilis diagnosis was elevated 9-fold in 2003 (OR=8.968; p=0.003) and 14-fold in 2007 (OR=14.314; p<0.001); for participants in the *main group* (subgroup 2): 4-fold in 2003 (OR=3.570; p=0.002) and 6-fold in 2007 (OR=5.784; p<0.001) – resulting in the strongest changes of all variables analyzed.

Anal gonorrhoea in the last twelve months is reported by less than one per cent in subgroups 1, 2, and 5, about two per cent among *core groups*, and about three per cent among *HIV-positive* respondents (data not shown).

Table 5: Participants with more than 20 sex partners; or who report Syphilis/Gonorrhoea in the twelve months preceding the survey

	1991	1993	1996	1999	2003	2007	adj. OR*	95%- CI		p	adj. OR*	95%- CI		p
20 sex partners or more					(%)			(1991-1999)				(2003-2007)		
<i>Young (HIV-neg./?)</i>	10.4	12.3	11.2	15.2	5.8	4.2	1.044	0.991	1.099	0.107	0.966	0.887	1.051	0.423
<i>Main (HIV-neg./?)</i>	16.2	19.7	22.2	26.6	21.3	12.7	1.071	1.053	1.089	<0.001	0.909	0.880	0.939	<0.001
<i>HIV-positive</i>	36.0	36.7	46.9	41.7	45.0	33.9	1.045	1.003	1.090	0.037	0.933	0.870	1.001	0.052
<i>Core groups</i>	71.2	72.5	74.4	76.0	75.8	69.4	1.033	0.998	1.070	0.063	0.962	0.899	1.029	0.261
<i>Non-scene</i>	6.0	7.8	9.0	11.7	8.9	7.5	1.086	1.047	1.127	<0.001	0.994	0.938	1.055	0.851
Syphilis				(%)				(1991-1999)				(2003-2007)		
<i>Young (HIV-neg./?)</i>	0.4	0.2	0.0	0.4	0.4	0.3	0.942	0.660	1.344	0.742	0.977	0.700	1.363	0.890
<i>Main (HIV-neg./?)</i>	0.3	0.4	0.3	0.6	1.1	1.7	1.044	0.934	1.167	0.449	1.131	1.017	1.257	0.023
<i>HIV-positive</i>	0.9	2.6	0.9	2.6	8.2	12.8	1.067	0.913	1.245	0.415	1.127	1.005	1.264	0.041
<i>Core groups</i>	1.5	1.0	0.6	1.8	5.1	5.3	1.010	0.876	1.164	0.889	1.022	0.891	1.172	0.757
<i>Non-scene</i>	0.1	0.1	0.4	0.4	1.2	2.1	1.175	0.932	1.482	0.173	1.154	1.004	1.326	0.043
Genital Gonorrhoea				(%)				(1991-1999)				(2003-2007)		
<i>Young (HIV-neg./?)</i>	3.7	2.4	1.5	5.4	2.0	1.3	1.031	0.938	1.132	0.529	0.923	0.799	1.066	0.275
<i>Main (HIV-neg./?)</i>	2.6	2.1	2.4	3.1	3.9	2.7	1.031	0.987	1.077	0.167	0.935	0.874	1.000	0.049
<i>HIV-positive</i>	6.6	3.1	5.8	4.7	6.9	9.2	0.998	0.910	1.095	0.967	1.144	1.006	1.300	0.040
<i>Core groups</i>	8.7	4.4	5.5	5.6	9.6	8.7	0.981	0.919	1.047	0.563	1.037	0.933	1.153	0.497
<i>Non-scene</i>	1.5	1.3	1.3	2.3	1.8	2.7	1.050	0.967	1.140	0.249	1.095	0.975	1.230	0.127

*Odds Ratios are adjusted for age, education, city size, and sexual identity (1991-99, 2003-07), and for Internet recruitment (2003-07).

Recreational Drug Use

Consumption of recreational drugs has been repeatedly described to be associated with sexual risk taking, and there are reports from many countries showing an increased consumption of recreational drugs in recent years. Consumption of recreational drugs has been monitored in our behavioural surveys since 1996. Like in comparable surveys, *HIV-positive* respondents or those who can be assigned to *core groups* consume more recreational drugs of any kind than other MSM (see Table 6). This has often been described as two faces of a hedonist lifestyle, or an accumulation of different risky behaviours, not necessarily indicating a *causal* relation [22]. In this analysis no clear trend can be observed regarding the consumption of party drugs or of Nitrite inhalants ('poppers'). The latter is remarkable, as consumption of 'poppers' is highly correlated with sexual, especially anal intercourse, partly because of its dilating effect on smooth muscles like the *sphincter ani*. The observed increase of anal intercourse with steady and casual partners, as shown before, is not accompanied by an increase of 'poppers' consumption. While the proportions of respondents who use party drugs or 'poppers' at least sporadically have been rather stable between 1996 and 2007, consumption of marihuana has been significantly declining (data not shown). The decline of marihuana use has also been described in representative surveys of the general population in Germany [23].

Table 6: Consumption of selected recreational drugs

Party drugs	1996	1999	2003	2007	adj. OR*	95%- CI		p	adj. OR*	95%- CI		p
					(1996-1999)				(2003-2007)			
<i>Young (HIV-neg./?)</i>	9.3	10.9	8.7	5.4	1.058	0.876	1.277	0.560	0.907	0.844	0.974	0.008
<i>Main (HIV-neg./?)</i>	14.7	17.2	18.7	14.1	1.059	1.004	1.118	0.034	0.939	0.910	0.970	<0.001
<i>HIV-positive</i>	33.3	33.9	40.6	33.0	1.021	0.904	1.152	0.740	0.931	0.868	.999	0.047
<i>Core groups</i>	29.1	34.2	34.8	32.7	1.090	1.002	1.185	0.044	0.977	0.916	1.041	0.470
<i>Non-scene</i>	11.6	14.2	15.5	13.4	1.065	0.968	1.172	0.199	0.970	0.927	1.016	0.198
Nitrite inhalants					(1996-1999)				(2003-2007)			
<i>Young (HIV-neg./?)</i>	11.2	10.9	7.2	6.1	0.999	0.832	1.199	0.990	1.015	0.942	1.094	0.693
<i>Main (HIV-neg./?)</i>	23.3	26.6	26.9	24.8	1.056	1.009	1.105	0.020	0.978	0.952	1.006	0.120
<i>HIV-positive</i>	51.5	52.8	61.9	54.4	1.028	0.916	1.153	0.637	0.922	0.860	0.988	0.22
<i>Core groups</i>	46.5	50.4	52.5	55.3	1.063	0.084	1.149	0.123	1.037	0.976	1.102	0.238
<i>Non-scene</i>	19.0	20.5	22.6	23.3	1.011	0.932	1.096	0.797	1.002	0.964	1.042	0.921

*Odds Ratios are adjusted for age, education, city size, and sexual identity (1991-99, 2003-07), and for Internet recruitment (2003-07).

HIV Testing

To evaluate HIV testing behaviour, *HIV-positive* respondents were merged into subgroups 1 and 2 (i.e. especially into the *main group*), in order for all remaining subgroups to be independent from HIV serostatus. The time frames for having recently been tested for HIV antibodies vary from 18 (1996) to 23 months (1991, 1993, 1999), or 14 (2003) and 16 months (2007).

Significant trends towards higher proportions of respondents with a recent HIV antibody test can be observed in all subgroups (Table 7). Again it needs to be underlined that internet recruitment of respondents was introduced in 2003; the changing sampling strategy as well as the declining time frame for a 'recent' HIV test explains the sharp drop of participants being tested for HIV antibodies between 1999 and 2003. Between 2003 and 2007, the observed rise in HIV testing clearly exceeds the increase that is expected because of slightly different time frames for a 'recent' HIV test.

It must be pointed out that an increased uptake of testing can not only be observed among *core group* participants with much higher number of sex partners and higher risks for HIV infection, but also among *non-scene* or *young* respondents. This is supported by the observation that the proportion of self reported positive test results among those who were recently tested for

HIV antibodies has been significantly declining between 2003 and 2007, after being rather stable during the 1990s. This suggests that, after 1999, the rising uptake of HIV testing might actually exceed the increase of newly diagnosed infections. As expected, a recent diagnosis of HIV infection is most pronounced among *core group* participants, and least among *non-scene* or *young* respondents.

The trend towards increased uptake of testing is supported by a growing number of respondents with more than two HIV tests; most pronounced in *core groups* during the 1990s, but also among *non-scene* respondents in both time frames, suggesting a broad and sustained uptake of HIV testing. Complementary, the proportion of participants who report to have never been tested for HIV has been continuously declining (data not shown). However, even among *core groups*, a substantial minority of participants (34 per cent in 1991, declining to 22 per cent in 2007) reports to have not yet been tested for HIV.

Table 7: Participants with a recent HIV test and – among those – the proportion of positive HIV test results

Recently tested for HIV	1991	1993	1996	1999	2003	2007	adj. OR*	95%- CI (1991-1999)		p	adj. OR*	95%- CI (2003-2007)		p
<i>Young</i>	43.4	48.6	48.8	55.6	27.0	31.0	1.058	1.023	1.094	0.001	1.096	1.052	1.142	<0.001
<i>Main</i>	36.0	42.1	40.4	43.6	34.3	37.9	1.039	1.025	1.052	<0.001	1.055	1.030	1.080	<0.001
<i>Core groups</i>	41.1	41.8	40.8	47.8	37.3	45.2	1.046	1.014	1.079	0.005	1.086	1.022	1.155	0.008
<i>Non-scene</i>	33.4	39.8	39.1	38.9	29.4	34.0	1.028	1.006	1.051	0.011	1.059	1.022	1.097	0.001
Positives among recently tested														
<i>Young</i>	4.2	4.2	2.2	5.6	1.9	0.8	1.035	0.920	1.164	0.568	0.820	0.606	1.110	0.199
<i>Main</i>	10.2	7.6	9.2	11.7	9.9	4.3	1.016	0.982	1.052	0.366	0.806	0.747	0.870	<0.001
<i>Core groups</i>	17.9	16.1	18.5	15.7	16.7	9.6	0.968	0.909	1.030	0.306	0.860	0.745	0.993	0.040
<i>Non-scene</i>	7.3	7.0	8.4	13.2	8.6	3.2	1.077	1.014	1.144	0.016	0.768	0.677	0.871	<0.001

*Odds Ratios are adjusted for age, education, city size, and sexual identity (1991-99, 2003-07), and for Internet recruitment (2003-07).

Discussion

Strengths and Limitations

To our knowledge, this is the first controlled trend analysis of risk taking and risk reduction strategies and sexual behaviour among MSM in Germany. For socio-cultural reasons, large visible gay communities only exist in Western post-industrialized countries. Germany is (after Russia) the most populous nation in Europe. Therefore, German gay men constitute one of the largest accessible gay communities worldwide. Accordingly, the *Gay Men and AIDS* studies constitute one of the largest datasets regarding MSM-related behavioural indicators as to HIV transmission, comprising more than 3,000 gay, homosexual, bisexual, etc. respondents in every follow-up survey, spanning a time period of eighteen years.

However, the interpretation of trends derived from non-representative cross-sectional survey data is limited. It cannot be excluded that the observed trends – even if statistically significant – reflect changes in the composition of the underlying convenience samples rather than trends among MSM. We therefore looked at different subgroups, such as *core groups*, *non-scene* respondents, different age groups as well as different serostatus. Furthermore, in multiple regression analyses, we controlled for known confounders such as age, education, city size, sexual identity, and – for the two surveys with additional Internet recruitment – for online/offline participation. However, even in an anonymous survey, underreporting of socially less acceptable behaviour cannot be excluded; and observed trends might also be attributable to shifts in social acceptability.

The GMA survey participants show a significant middle class bias; MSM from lower social classes are underrepresented. Controlling for education in multivariate analyses aims to mini-

mize the likelihood that observed trends are based on shifts in the composition in the samples towards higher proportions of MSM with lower education, indicating lower social class. If a behavioural trend only exists among MSM from lower social classes, the GMA surveys might easily miss it, basically because of using convenience samples and extensive self-administered questionnaires [22].

Another limitation of the analysis is based on the change in the sampling strategy in 2003: Trends present between 1999 and 2003, but not before or afterwards, may thus be overlooked. Not covered by our data are macro-structural variables such as overall acceptance of homosexuality, or income related inequality, that are known to have an impact on infection rates of HIV and other STIs [24-26].

Sexual Behaviour, Drug Use and STIs

The most consistent, sustained and strongest observed behavioural change among MSM in Germany between 1991 and 2007 seems to be the increase of the proportion of respondents who frequently engage in anal intercourse, most pronounced with casual partners. Corresponding results have been found in other post-industrialized countries: Swiss and French behavioural surveillance data on MSM – using similar methodology and a closely related questionnaire – show significant increases of respondents who practice anal intercourse (AI) both with primary and casual partners [27, 28]. In the NATSAL-study – a representative survey based on the British general population – Catherine Mercer et al. described increasing proportions of MSM who engage in anal intercourse between 1990 and 2000, the proportions are however based on relatively small numbers of MSM-participants [29]. In the Australian *Gay Community Periodic Survey* (GCPS, one of the largest behavioural surveys among gay men worldwide, with yearly follow-up) decreasing proportions (1998-2007) of gay men who report ‘no anal’ intercourse could be found among participants with either HIV-nonconcordant or HIV-negative-concordant casual partners [30]. We think it is important to stress that we did not only find a significant positive trend for MSM who *generally* practice AI with casual partners, but also for MSM who do this *frequently*. Questions on self-reported consistency of condom use in most (if not all) behavioural questionnaires do not reflect whether condoms were used correctly for each and every act of anal intercourse (e.g. material, lubricant, application, change of the condom for every new partner in group sex settings). Hence, although usually not publically stated, consistent condom use does not result in 100% reduction of HIV transmission [31]. This means – given a relevant ‘community viral load’ – that even if all other factors were constant and condoms were ‘consistently’ used by all MSM, the substantial absolute increase of anogenital contacts with casual partners alone could explain an increase in HIV incidence.

Most publications on trends in risk taking among MSM focus on *unprotected* anal intercourse (UAI), as UAI carries the biggest risk for sexual HIV transmission. Typical indicators are, like in the German behavioural surveys, the proportion of men who report UAI with casual (or other non-primary) partners or who report UAI with nonconcordant sex partners. Regarding gay men surveyed annually in central London gyms, Jonathan Elford et al. describe an increase of nonconcordant UAI with casual partners between 1998 and 2001, followed by a decrease between 2002 and 2005 [32]. Similar trends have been described by Iryna Zablotska et al. for GCPS participants from New South Wales [7, 33]. In the GMA data, the time frame between 1999 and 2003 is difficult to evaluate because of the previously described changes in the sampling approach. However, for GMA participants who can be ascribed to core groups, the observed trends are concurrent with the findings from the UK and Australia; especially if taken into account that users of gyms with a predominantly gay clientele or gay men recruited at gay venues in Sydney are likely to be well connected to the *gay scene* and therefore be closer to the GMA *core groups* than to *non-scene* respondents.

Like in the Australian GCPS studies [30], the German GMA studies showed no evidence of broad trends towards more ‘inconsistent’ condom use in anal intercourse with casual partners; and the proportions of ‘consistent’ condom users are about the same. Unlike the broader groups of participating MSM, HIV-positive GMA participants show a trend towards less ‘consistent’ condom use, suggesting increasing serosorting, as exemplified in the GCPS data. Unfortunately, longitudinal trends in attitudes towards serosorting or other strategies regarding selective condom or negotiating agreements around sexual risks use cannot directly be drawn from GMA data.

Taken together, a pronounced and generalizable erosion of safer sex practices over the last seventeen years is not supported by our data; the same holds true for general condom acceptance or general condom fatigue. HIV awareness and a general readiness for condom use in anal intercourse seem to be sustainably high. It should be emphasized that this also applies to *young* respondents. Although frequently stated otherwise, an erosion of safer sex practices among young German MSM can not be observed, as documented previously [34].

The parallel increase of (frequent) anal intercourse in all subgroups and the high rates of UAI within relationships in our view exemplify the prevailing wish for a sexuality that is physically intimate (*leibnah*). As Martin Dannecker pointed out, “the physical distance imposed by HIV prevention is experienced as being more limiting in a love relationship than in casual contacts” [20]. The movement from exceptionalism to normality can thus not only be described for the field of public health policy [35], but also for gay sexuality, starting with primary partners (where infection risks are usually perceived as being low), extending to sexual contacts with casual partners; maybe especially with casual partners who are not anonymous, or who are regarded as potential *lovers* (as opposed to pure *fuck buddies*). To summarize, we interpret the increase in anal intercourse among MSM as an integral part of the AIDS normalization process, which neither should be mistaken for ‘carelessness’ nor ‘therapy optimism’.

As particularly MSM who are young are often being blamed for increasingly practising a ‘careless’ sexuality, it should be pointed out that the (re-)normalization of anal intercourse is especially pronounced among *young* respondents (subgroup 1), while a rise in risk-taking in this group can not be observed.

There is evidence, although only indirect, that individual risk management strategies have been increasingly used by gay men who are HIV positive. It cannot be stressed enough that trends towards increasing individualized strategies for the prevention of HIV transmission are highly concurrent with increasingly individualized risk management approaches in most other fields (“informed consent, contractual interaction, free market choice, responsibility”, as summarized by Barry Adam [36]). A rise in individualized HIV risk management therefore should not be interpreted as generalized ‘irresponsible behaviour’ (of all subgroups, HIV-positive respondents showed the highest rates of consistent condom use with primary partners). It can rather be described as a ‘(re-)normalization’ of gay sexuality combined with the demands of increasingly individualized societies [37, 38]. This applies especially to HIV-positive gay men: It is remarkable that the calling into question of solidarity-based systems in many European countries is accompanied by a growing pressure towards HIV-positive MSM to personally support the pursuit of low ‘community viral load’ instead of their personal health or otherwise defined well-being.

Increases in the consumption of recreational drugs could be demonstrated for *core groups* during the 1990s. This could partly explain the parallel increase of risk taking in this subgroup. Both increases however do not continue after 2003. The broad majority of MSM, including *young* MSM, seems to be less affected by this phenomenon. Unlike findings from the EXPLORE study (San Francisco), *young* respondents of the German GMA studies were not more likely to report increasing use of sniffed cocaine, methamphetamines, or Nitrate inhalants [39].

As to sexually transmitted infections among MSM, we see clear evidence that the syphilis epidemic is not paralleled by an epidemic of genital gonorrhoea. The observed rise in syphilis diagnoses in the national infectious diseases notification system is almost exactly reflected in our

behavioural surveys for MSM. This has two implications: (1) We think it is unlikely that the same behavioural surveys would miss a respective trend in gonorrhoea, which is not covered by the national notification system. At least genital gonorrhoea in men is highly likely to be symptomatic, and therefore presented to a physician, diagnosed and treated. Even if syphilis might be regarded as more threatening than gonorrhoea, we do not feel a recall bias is enough to explain the absence of increasingly reported genital gonorrhoea in our data, especially given that an episode of genital gonorrhoea usually presents itself as a painful event. (2) The parallelism of a syphilis epidemiology among MSM in the German infectious diseases notification system and our surveys strengthens the generalizability of several outcomes. It would not be plausible to argue that we miss a strong trend for example in the number of sex partners or the extent of risk taking, due to changes in the sample composition towards respondents with general lower risk profiles, while still observing a substantial syphilis epidemic in all subgroups except *young* MSM.

However, according to our data and supported by evidence from other studies [25, 26], a recent history of syphilis is less associated with education (and thus social class) than HIV serostatus. If controlled for age, sexual identity, city size, sexual identity and sampling strategy, the respective protective effect of a general qualification for university was bigger for HIV infection than for a recent history of syphilis (Syphilis: adj. OR=0.742; 95%-CI: 0.587-0.936; diagnosed HIV infection: adj. OR=0.544; 95%-CI: 0.493-0.600). This is plausible, as transmission of *treponemata* (or likewise *gonococci*) is individually more difficult to prevent than transmission of HIV: not only is safer sex more effective for the prevention of HIV than of bacterial STIs (in Germany, like in many other countries, safer sex implies condom use for anal, but not for oral penetration, as the risk for HIV transmission through oral intercourse is widely regarded as very low [40]); also, individual risk reduction strategies based on negotiating agreements require substantial communicational skills.

Systematic screening of large numbers of gay clients of STI clinics in San Francisco have shown that the proportion of anorectal gonorrhoea is of the same magnitude as genital gonorrhoea [41]. Because of limiting German routine screening recommendations and reimbursement practice, anorectal gonorrhoea is probably widely underdiagnosed and therefore prone to underreporting. Long persisting inflammation of anorectal mucosa, i.e. local immune activation, increases susceptibility for HIV infection [42], especially putting at risk affected men with high numbers of sex partners who visit gay venues where partner fluctuation is very high.

It seems likely that the incidence of anorectal gonorrhoea is about the same as of genital gonorrhoea, especially in subgroups with frequent anal intercourse with casual partners. Due to underdiagnosis and hence undertreatment, its prevalence will be higher than the prevalence of genital gonorrhoea. Routine screening for anorectal gonorrhoea seems to be crucial not only for anally receptive men who are HIV positive, but also for anally receptive men who are not HIV positive but have anal intercourse (with or without a condom) with a high number of sex partners (e. g. MSM who can be ascribed to *core groups*).

Trends of increasing syphilis and anorectal gonorrhoea among MSM who visit STI clinics in San Francisco have also been described by Truong et al. [43]. These increases were not accompanied or followed by a respective increase of HIV incidence. Diverging incidences of HIV and certain bacterial STIs can be explained by different routes of transmission, differential infectivity, and last but not least by serosorting [see also Jin 2007, Mao 2006]. In behavioural surveys, another plausible factor is diverging trends of testing behaviour.

HIV Testing

“With the increase in therapeutic possibilities AIDS representation changes and is increasingly perceived and managed as a chronic disease”[35]. Likewise, with the broad introduction of ART, HIV testing has been increasingly promoted as an instrument of secondary prevention. German AIDS organizations have adapted this recommendatory praxis later than comparable

organizations e.g. from the UK, Australia, Austria, or Switzerland. However, we think it is highly plausible that also German MSM more regularly use HIV testing as an integral part of their risk management strategy.

A rising uptake of HIV testing among MSM has been most pointedly described for the UK and Australia [7, 33]. The question, however, to what extent increasing rates of newly diagnosed HIV infections can be explained by increasing HIV testing has been answered differently in these publications. In the GMA surveys there is substantial evidence for a significant rise in HIV testing in all subgroups analyzed, including *non-scene* respondents. Changes in the sample composition – assuming residual confounding – are least likely to explain this observation: All shifts within the sample point towards age groups beyond the most sexually active, towards lower degrees of education, towards MSM outside of metropolitan areas, towards MSM who do not self-identify as gay or homosexual, and especially towards non-scene-using MSM, thus towards a lower likelihood of being recently tested.

There is no empirical evidence from the GMA surveys for a proportional increase of HIV diagnoses among MSM who were recently tested for HIV antibodies. However, if more and more MSM get tested for HIV, or if those who are at risk for HIV infection are tested more frequently, this would explain at least partly the observed absolute rise in newly diagnosed HIV infections, as seen in the national infectious diseases notification system.

Representative studies from the UK have suggested an “increasing prevalence of homosexual intercourse among the British male population“ [29]. It is possible that this observation is confounded by rising rates for disclosing same sex sexual behaviour in population based surveys due to a more liberal ‘climate’ in many Western European societies. It is also possible that because of a more gay-friendly ‘climate’, and because of rising chances – thanks to Internet chat rooms for MSM – of finding same sex partners outside metropolitan areas and beyond the world of gay venues, opportunities for homosexual intercourse have become more; and the absolute number of men, who recently had sex with men could in fact be rising. Rising absolute numbers of so-defined MSM and rising numbers of MSM who are tested for HIV could well explain increasing HIV diagnoses. However, because of the middle class bias of the GMA surveys, we cannot exclude that a trend towards higher proportions of HIV-positives among MSM who are recently tested is absent in the GMA data but present among MSM from lower social classes.

Conclusions

With the normalization of AIDS, restriction of anal intercourse to primary partnerships has lost its relevance as a risk avoidance strategy for MSM. Apart from that, traditional risk reduction strategies among MSM in Germany show a high degree of time stability: Condom use in anal intercourse can be shown to have been relatively stable over the last seventeen years. Furthermore, numbers of sex partners have been rather constant. No positive trends in the use of Nitrite inhalants could be seen, and party drugs were increasingly used by a minority of gay men during the 1990s. The GMA follow-up surveys show indirect evidence that individual risk management strategies have been increasingly used by gay men who are HIV positive.

To summarize, we found no evidence for increasing ‘carelessness’, ‘prevention fatigue’, ‘condom fatigue’, or a decline of condom acceptance. The trends we could observe can better be described as a ‘(re-)normalization’ of gay sexuality enframed by the demands of increasingly individualized societies. This finding also coincides with a rise in HIV testing as a part of individual risk management.

However, given the increasing proportions of MSM who frequently engage in anal intercourse with casual partners, a rise in HIV incidence is likely – despite the high degree and relative stability of safer sex commitments among gay men.

The syphilis epidemic seen after 1999 among MSM in Germany is well reflected in the GMA behavioural surveys. No evidence could be found for a concurrent rise in urethral infections with gonococci, but rectal manifestations are likely to be underdiagnosed. Syphilis and anorectal gonorrhoea substantially increase the per-contact risk for HIV transmission. Therefore it seems urgently necessary to reappraise German STI screening recommendations for (subgroups of) MSM and related reimbursement policies. Questions on access to STI screening, or questions on barriers to undergoing diagnostic procedures in the absence of symptoms need to be routinely implemented into HIV-related behavioural studies, especially for populations where anal intercourse is rather common.

The proportion of MSM with a recent HIV test has been continuously increasing. There is broad evidence that this finding is representative for gay men in Germany and not attributable to changing sampling strategies within the GMA surveys. The time trend analyses of these large national behavioural surveys suggest that the rise in new HIV diagnoses among MSM in Germany may partially reflect an increased uptake of HIV testing, rather than new infections due to the erosion of condom use or increased numbers of sex partners.

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