weeks' gestation had raised death rates from non-cardiovascular causes, reflected in higher rates from all causes combined. This was unexpected and requires confirmation by continued follow up and other studies now in progress. The babies born after term had larger head size, which was also associated with higher rates of disease other than cardiovascular disease.

In conclusion, this study shows for the first time that reduced fetal growth is followed by higher death rates from cardiovascular disease in adult life. Bodily proportions at birth suggest that the growth reduction began early in gestation. We suggest that this is further evidence that cardiovascular disease originates through programming in fetal life and infancy. Maternal nutrition may be an important influence on programming.

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Sexually transmitted diseases and HIV-1 infection among homosexual men in England and Wales

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Abstract

***Objective*—To examine surveillance data for evidence of changing sexual behaviour and continuing transmission of HIV-1 among men who have sex with men.**

***Design*—Analytic study of surveillance data on sexually transmitted diseases.**

***Setting*—England and Wales.**

***Main outcome measures*—Number of cases of rectal gonorrhoea and newly diagnosed HIV infection in homosexual men.**

***Results*—New cases of gonorrhoea among men attending genitourinary medicine clinics increased by 7·7% in 1989 and by 4·2% in 1990. Reports of rectal isolates of *Neisseria gonorrhoeae* also rose and the male to female ratio for patients with rectal gonorrhoea changed from 0·3:1 during 1988-9 to 2·6:1 in 1990-1. Although the overall number of cases of acute hepatitis B fell during 1988-91, 81 and 82 homosexual men were infected in 1990 and 1991 respectively compared with 50 and 42 in 1988 and 1989. 1526 men had HIV-1 infection diagnosed in 1991, the largest number since 1987. Twenty eight of the 97 (29%) men who seroconverted between January 1989 and December 1991 were aged less than 25. The proportion of men aged 15-19 who were found to be infected with HIV-1 at their first test increased from an average of 2·4% up to 1990 to 4·7% in the first nine months of 1991. The prevalence of HIV infection in men under 25 attending genitourinary medicine clinics in London was 17% compared with 7·8% outside London.**

***Conclusion*—Unsafe sexual behaviour and HIV transmissions have increased among homosexual men after a period of decline. Recent HIV transmissions may disproportionately affect younger men.**

Introduction

A decline in the incidence of sexually transmitted diseases in men who have sex with men was well documented in the mid-1980s in various developed countries, including the Netherlands,[1] the United States,[2] and Britain.[3] Those undertaking health promotion saw this as evidence that sexual behaviour could be changed and that educational messages about safer sex had been heeded by homosexual men. In Britain, however, homosexual men infected with HIV-1 still contracted gonorrhoea,[4] which implied continued participation in unprotected sexual intercourse. In 1989 increases in the incidence of sexually transmitted disease in homosexual men in the United States suggested that high risk sexual behaviour between men was increasing after a period of decline.[5] Increases in sexually transmitted diseases in homosexual men were also reported in Amsterdam[6] and Australia.[7]

In 1990 increases in rectal gonorrhoea in men were noted in several genitourinary medicine clinics in London and elsewhere in Britain.[8-13] Repeat testing

of initially seronegative homosexual men showed continuing transmission of HIV-1 infection[14] and, in London, the incidence of infection increased in 1990-1 compared with earlier years.[15] Behavioural data from a cohort study supported the view that an increase in high risk sexual behaviour between men occurred in 1989-90.[16]

Methods

We examined surveillance data for England and Wales on sexually transmitted diseases. Trends in infections likely to have been transmitted by unprotected sexual intercourse between men were analysed for indications of changes in sexual behaviour.

We reviewed the quarterly KC60 returns from all genitourinary medicine clinics in England and Wales to determine the number of attenders for each diagnosis, sex, and (for some diagnoses) sexual orientation and age group. Laboratory reports of rectal isolates of *Neisseria gonorrhoeae*, cases of acute hepatitis B virus infection, and newly diagnosed HIV-1 infection were analysed. Most of the reports of *N gonorrhoeae* infection included the sex of the patient but not sexual orientation. For a small proportion of patients infected with HIV-1 the year and month of a previous negative HIV-1 test result had been established and we examined the characteristics of these seroconverters. As part of a study of HIV testing 18 laboratories provided aggregate data, by exposure category, on all persons tested. We used these data to calculate the annual age specific prevalence of HIV-1 infection at initial HIV-1 testing among homosexual men.[17] The unlinked anonymous serosurvey of people attending genitourinary medicine clinics provided further data on the age specific prevalence of HIV infection and acute sexually transmitted disease among homosexual men. Patient diagnosis (KC60 code) is collected in this survey[18] and grouped into broad categories including acute sexually transmitted diseases (such as gonorrhoea or a first attack of genital herpes). We analysed data, where appropriate, by standard χ^2 tests and linear modelling on a log scale assuming the observed frequencies to be distributed as Poisson variables.

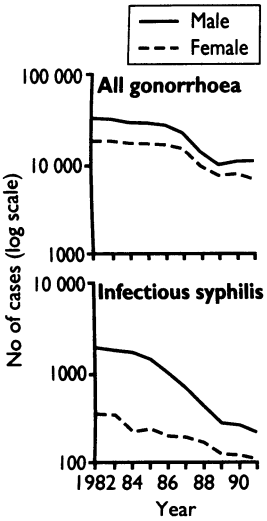

FIG 1—*New cases of gonorrhoea (top) and infectious syphilis (bottom) seen at genitourinary medicine clinics, England and Wales*

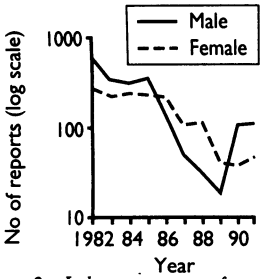

FIG 2—*Laboratory reports of rectal isolates of Neisseria gonorrhoeae from people aged 15 years or over, England and Wales*

Results

From 1981 to 1988 the number of attendances at a genitourinary medicine clinic for uncomplicated postpubertal gonorrhoea fell consistently (fig 1 (top)). Attendances then began to increase with a 7·7% rise for men in 1989 and a further rise of 4·2% in 1990 (χ^2=9495, df=8; p=0). Rises in numbers of people with gonorrhoea were observed within and outside the Thames regions in 1989 (J Hilton, personal communication). Although the number of cases of infectious syphilis seen in genitourinary medicine clinics has fallen since 1981, the rate of fall slowed in 1988 (fig 1 (bottom)). A Poisson regression test for non-linearity in the separate trends gave χ^2 values of 408 with 16 degrees of freedom ($p<0·001$).

The annual total of laboratory reports of isolation of *N gonorrhoeae* in rectal specimens in men fell consistently between 1982 and 1989, with the exception of 1985. In 1990 and 1991, however, reports of isolates from men increased fivefold (fig 2). From 1986 to 1989 most rectal isolates were from women, but in 1990 and 1991 reports from men outnumbered those from women by more than 2·5 to 1. The trends over time were significantly different in the two sexes (χ^2=275, df=9; $p<0·0001$) and significantly non-linear (χ^2=514, df=16; $p<0·0001$).

The number of cases of acute hepatitis B diagnosed each year in men aged 15 years or over increased during the early 1980s, and reached a peak of 1285 in 1984. Annual numbers fell rapidly from 1985 to 1987 and more gradually thereafter (table I). The trend was significantly non-linear (χ^2=506·3, df=8; $p<0·0001$). Only 343 cases were diagnosed and reported in 1991 (provisional data) in men aged 15 years or over, fewer than in any of the preceding 10 years. More than 80 cases in homosexual men were reported in both 1990 and 1991, double the 42 cases reported in 1989 and higher than the number reported in any year since 1986. This trend was also significantly non-linear (χ^2=74, df=8; $p<0·0001$).

TABLE I—*Laboratory reports of acute hepatitis B infection in men (aged 15 years or over) by year of diagnosis, England and Wales*

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991*
Homosexual or bisexual	104	115	141	126	110	50	52	42	81	82
No risk information	346	322	457	468	352	231	203	226	180	140
Others	414	450	687	612	383	231	185	141	145	121
Total	864	887	1285	1206	845	512	440	409	406	343

TABLE II—*Newly diagnosed and reported HIV-1 infection in men who have sex with men, England and Wales*

	<1985	1986	1987	1988	1989	1990	1991
Annual total	1396	1600	1546	1062	1116	1428	1526
No for whom age known	1273	1488	1465	1028	1075	1415	1521
Median age (years)	33	32	33	33	33	32	31
No aged 20-24	207	242	238	121	135	181	177
No aged <19	20	28	26	14	20	26	27

TABLE III—*Year of seroconversion in 307 homosexual men who had had negative test results, England and Wales*

Year of last negative result	Year of first positive result						
	1985	1986	1987	1988	1989	1990	1991
1985	16	21	10	3	4	3	2
1986		13	18	1	5	3	7
1987			13	6	9	16	7
1988				7	19	13	14
1989					6	25	11
1990						14	29
1991							12

HIV INFECTION

For 1988 the number of reports of newly diagnosed HIV-1 infection in men who had had sex with men (1062) was the lowest in any year since the widespread introduction of testing. After 1988 it increased each year to 1526 in 1991 (table II). The median age of homosexual men with recently diagnosed HIV-1 infection did not increase, and both the number and the proportion of HIV-1 infections diagnosed in younger homosexual men remained similar over time (table II). In 1990 and 1991, 358 (12%) cases were in men aged 20-24 and 53 (2%) in men aged 19 years or under. Among the two thirds for whom information on symptoms was supplied at the time of diagnosis of HIV-1 infection, the proportion asymptomatic remained relatively constant: 53% in 1986-7, 46% in 1988-9, and 52% in 1990-1.

A previous negative test result was recorded for 307 of the homosexual men infected with HIV (table III). Rolling totals were calculated for successive three year periods: in 1985-7 there were 91 homosexual men who had a negative test followed by a positive one; in 1986-8 there were 58 such men; in 1987-9 there were 60; in 1988-90 there were 84; and in 1989-91 there were 97 (table III). Of the 97 men known to have seroconverted during 1989-91 28 (29%) were aged under 25. Among asymptomatic homosexual men newly diagnosed as infected with HIV during 1989-91 the proportion under 25 was 17% (271 of 1570).

During 1987 to 1991, 958 homosexual men aged 19

years or under had, for clinical purposes, had a first HIV test at one of the 18 laboratories participating in the study of HIV testing. Between 149 and 194 were tested annually from 1987 to 1990 and the prevalence of HIV-1 infection ranged from 2·1% to 2·7%. However, in 1991, 12 (4·7%) of the 257 men tested were infected. This is significantly more than should occcur by chance if the true risk were equal to the largest previously observed proportion (p=0·04).

Data from the unlinked anonymous genitourinary medicine clinic serosurvey showed that in 1990, 343 of 1391 (25%) samples from non-drug injecting homosexual men in two London clinics were infected with HIV-1 compared with only 20 of 356 (5·6%) from men in four clinics outside London (χ^2=63·5, df=1; p < 0·0001). The prevalence of HIV-1 infection recorded in those aged less than 25 years was 17% (52/305) among those tested in London and 7·8% (8/103) among those tested outside London (χ^2=5·5, df=1; p=0·02). Of the 363 homosexual men who tested HIV-1 positive, 80 (22%) had an acute sexually transmitted disease diagnosed at the time blood was collected for investigation of syphilis.

Discussion

The extent to which isolation of *N gonorrhoeae* is indicative of risk of HIV-1 infection is debatable,[12] but it is reasonable to regard rectal gonorrhoea as a marker for high risk homosexual behaviour.[11] Thus the increase in gonorrhoea in men attending genitourinary medicine clinics in 1989 and 1990 and the increase in rectal isolates of *N gonorrhoeae* in men suggest that the behaviour associated with risk of HIV-1 transmission among homosexual men has also increased. The rise in the number of rectal isolates of *N gonorrhoeae* in men reported for England and Wales in 1990 is not attributable to an increase in the number of reporting laboratories, and the marked shift in the male to female ratio of cases from which these isolates were obtained is unlikely to be caused by changes in the catchment population.

Although further research would be necessary to establish the extent to which sexual practices which limit the risk of HIV transmission overlap with those which would prevent transmission of hepatitis B virus, the rise in hepatitis B infection reported in homosexual men is also suggestive of increased unsafe sex in this group. An effective vaccine is available against hepatitis B and thus increasing incidence of acute hepatitis B infection reflects the failure of health care providers to deliver hepatitis B vaccine to those at risk. A postal survey of genitourinary medicine clinics in 1988 showed that a third offered hepatitis B vaccine to clinic attenders,[19] and a recent audit report from a London genitourinary medicine clinic estimated that vaccine was delivered successfully to only a quarter of susceptible new homosexual patients.[20] At present, it seems, acute hepatitis B in homosexual men is a more effective marker of unsafe sex than it should be.

New reports of HIV infection in men who have sex with men disproportionately could relate to people who were infected before the implementation of health education programmes but delayed having a test. If this was the case new reports would be expected to include fewer recent infections and the average age of people with newly diagnosed HIV infection and the proportion symptomatic at the time of the HIV-1 test would rise. As neither has happened it is probable that the incidence of HIV-1 infection among homosexual men has not fallen. The 5·6% annual infection rate among initially uninfected homosexual men in London who had repeat HIV-1 tests during 1990-1[15] and the presence of HIV-1 infection in one in 20 homosexual men aged 19 years or under who were first tested during 1990-1 are further indications that transmissions continue. Transmission of infection is occurring both among the young, who may not have been fully exposed to the health education of the mid-1980s, and in older age groups, who may have changed to unsafe sex practices after previously heeding health advice. Two thirds of recognised seroconversions were in men aged 25 years or over, and the increase in sexually transmitted diseases was not confined to young men.

As the prevalence of HIV-1 infection among homosexual men has risen so the risk of exposure to HIV-1 with each unsafe sexual encounter will have increased. Moreover, the data from the unlinked anonymous survey shows that some men who knew they were infected with HIV-1 still acquired acute sexually transmitted diseases.[21] If they acquired these infections from HIV negative partners, those partners will have been at risk of HIV infection. The continuation of high risk behaviour in this group, who would have been counselled about safe sex when tested for HIV-1 infection, is of particular concern, as are seroconversions in those known to have had a negative test result. In the first case counselling has failed to protect others and in the second it has failed to protect the person counselled.

The data examined in this study give a consistent picture of behaviour changes among homosexual men which have led to a continuance of HIV transmission in this group in England and Wales. Because of the high background prevalence of HIV-1 infection risks to homosexual men practising unsafe sex are greatest in London. Health promotion for all men who have sex with men is important, but safe sex information aimed at young homosexual men and homosexual men in London needs special emphasis.

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