- 2 Waxweiler RJ, Beaumont JJ, Henry JA, Brown DP, Robinson CF, Ness GO, et al. A modified life-table analysis system for cohort studies. *J Occup Med* 1983;25:115-24.
- 3 World Health Organisation. *Proposal for the multinational monitoring of trends and determinants in cardiovascular disease and protocol (MONICA project)*. Geneva: WHO, 1983. (WHO/MNC/82.1)
- 4 Tunstall-Pedoe H. Diagnosis, measurement and surveillance of coronary events. *Int J Epidemiol* 1989;18:169-73.
- 5 Tuomilehto J, Kuulasmaa K. WHO MONICA project: assessing CHD mortality and morbidity. *Int J Epidemiol* 1989;18(3 suppl 1):38-45S.
- 6 Thorgerisson G, Davidsson D, Sigvaldason H, Sigfusson N. Major risk factors for coronary heart disease mortality in Icelandic women. *Eur Heart J* 1990;11:326.
- 7 Block WD, Jarrett KJ, Levine JB. An improved automated determination of serum total cholesterol with single color reagent. *Clin Chem* 1966;10:681-9.
- 8 Rose GA, Blackburn H. *Cardiovascular survey methods*. Geneva: World Health Organisation, 1968:160-2.
- 9 Cox DR. Regression models and life tables. *Journal of the Royal Statistical Society* 1972;34[B]:187-220.
- 10 Ragnarsson JO, Stefansdottir E. *Icelandic nutritional survey 1979-1980. RALA report*. Reykjavik: Agricultural Research Institute, 1981:74.
- 11 Agricultural Production Board. *Arbok landbunadarins* [Icelandic agricultural yearbook]. Reykjavik: APB, 1970, 1975, 1980, 1985, 1987.
- 12 Statistical Bureau of Iceland. *Hagridindi. Iðnadarvörðframlidsla* [A monthly statistical bulletin. Industrial production.] Reykjavik: SBI, 1971 56 (12); 1981 66 (12).
- 13 Breslow NE, Day NE. *Statistical methods in cancer research. Vol 1. The analysis of case-control studies*. Lyons: International Agency for Research on Cancer, 1980. (IARC Scientific Publications, No 32.)
- 14 Breslow NE, Day NE. *Statistical methods in cancer research. Vol 2. The design and analysis of cohort studies*. Lyons: International Agency for Research on Cancer, 1980. (IARC Scientific Publications, No 32.)
- 15 Segi M. *Cancer mortality for selected sites in 24 countries (1950-1957)*. Sendai: Tohoku University School of Medicine, 1960.
- 16 Multiple Risk Factor Intervention Trial Research Group. Multiple risk factor intervention trial; risk factor changes and mortality results. *JAMA* 1982; 248:1465-77.
- 17 Hilmarsson E, Valdimarsson G, Thorkelsson G. Innlend matvælaframleidsla [Domestic food production]. In: *Manneldi og neysla*. Reykjavik: Ministry of Health and Social Security, 1989:155-88.
- 18 Rifkind BM. Clinical trials of cholesterol lowering. *Atherosclerosis Reviews* 1988;18:59-70.
- 19 Keys A, Anderson J, Grande F. Serum cholesterol response to dietary fat. *Lancet* 1957;787.
- 20 Dobson AJ. Trends in cardiovascular risk factors in Australia, 1966-1986: evidence from prevalence surveys. *Community Health Stud* 1987;11(1):2-14.
- 21 Sytkowski PA, Kannel WB, D'Agostino RB. Changes in risk factors and the decline in mortality from cardiovascular disease. The Framingham heart study. *N Engl J Med* 1990;322:1635-41.
- 22 Dwyer T, Hetzel BS. A comparison of trends of coronary heart disease mortality in Australia, USA and England and Wales with reference to three major risk factors—hypertension, cigarette smoking and diet. *Int J Epidemiol* 1980;9:65-71.
- 23 Beaglehole R, Hay DR, Foster FH, Sharpe DN. Trends in coronary heart disease mortality and associated risk factors in New Zealand. *N Z Med J* 1981;93:371-5.

(Accepted 15 March 1991)

Excess mortality associated with the HIV epidemic in England and Wales

Anna McCormick

Office of Population
Censuses and Surveys,
London WC2B 6JP
Anna McCormick, FFFPHM,
senior medical statistician

BMJ 1991;302:1375-6

Increased mortality unattributed to but probably associated with HIV infection has been reported in the United States.¹⁻³ Excess mortality has also been identified among HIV positive haemophiliac patients in the United Kingdom.⁴ A study of trends in mortality between 1984 and 1987 suggested that the increase found among single men was probably related to HIV infection.⁵ In this paper I examine the number of excess deaths in England and Wales in 1988 and 1989 and relate this to the HIV epidemic.

Patients, methods, and results

Draft death entries on which one of 95 selected conditions was stated to be the cause of death were identified at the Office of Population Censuses and Surveys (OPCS). These causes were selected because they had been mentioned on death certificates of people known to have had AIDS. They included 86 medical causes, including AIDS and HIV infection (International Classification of Diseases (ICD) code 279.1). Nine external causes were also included, covering drug dependence and poisoning due to various substances. The number of excess deaths was estimated by subtracting the number of deaths in 1984 from the number in each subsequent year after adjusting for population changes within each five year age group. The numbers of reports of people who died with AIDS and HIV positive people who died without developing an AIDS indicator disease were obtained from the Public Health Laboratory Service Communicable Disease Surveillance Centre (CDSC).

There were 2505 deaths due to one of the 95 causes among single men aged 15-54 in 1989—498 (25%) above the number expected based on rates in 1984. AIDS or HIV infection was stated as the cause of death for only 233 (47%) of the excess deaths, leaving 265 (53%) probable HIV related deaths attributed to some other cause.

Analysis of the 86 medical causes alone showed that there were 1362 deaths among single men aged 15-54 in

1989—379 (39%) above the number expected—233 (61%) of which were attributed to AIDS or HIV infection. There was no similar increase among men of other marital states or among women. The increase was greatest among single men aged 30-44 and in the Thames health regions.

Analysis of the nine external causes alone, however, showed a different picture. Among single men aged 15-54 there were 1143 deaths in 1989, 119 (12%) above the number expected compared with 1984. Smaller increases also occurred among men of other marital states and among women. The increase among single men was greatest among those aged 15-24 and was fairly evenly distributed across the country, suggesting that factors other than the HIV epidemic may have contributed.

In all, 376 deaths among HIV positive single men aged 15-54 were reported to CDSC in 1989, an excess of 347 compared with 1984. If the total number of deaths reported to OPCS is used as the denominator 70% were reported to CDSC in 1989. However, if deaths reported to OPCS due to the 86 medical causes alone is used 92% were reported to CDSC.

Comment

The associations with age, sex, marital state, and geographic location suggest that the continuing increase in the number of deaths due to the 86 HIV related

Number of excess deaths due to HIV related causes and of deaths from AIDS or HIV infection in single men aged 15-54 in England and Wales during 1985-9 compared with rates in 1984

medical causes in this country is associated with HIV infection. The contribution of HIV to the smaller increase in the number of deaths due to external HIV related causes is more tenuous and requires further investigation. This could include testing for HIV in people who die of or receive medical care for these conditions. Accurate diagnosis and more complete reporting are required if the full extent of the HIV epidemic is to be identified.

I thank my colleague Tim Devis, statistician, for his help in extracting mortality data.

- 1 Buehler J, Berkman R, Devine O, Chevarley F. Impact of the human immunodeficiency virus epidemic on mortality trends in young men, United States. *Am J Public Health* 1990;80:1080-6.
- 2 Centers for Disease Control. Increase in pneumonia mortality among young adults and the HIV epidemic. *MMWR* 1988;37:593-6.
- 3 Marzuk PM, Tierney H, Tardiff K, Gross EM, Morgan EB, Hsu M-A, *et al*. Increased risk of suicide in persons with AIDS. *JAMA* 1988;259:1333-7.
- 4 Darby SC, Rizza CR, Doll R, Spooner RJD, Stratton IM, Thakrar B. Incidence of AIDS and excess mortality associated with HIV in haemophiliacs in the United Kingdom: report on behalf of the directors of haemophilia centres in the United Kingdom. *BMJ* 1989;298:1046-8.
- 5 McCormick A. Trends in mortality statistics in England and Wales with particular reference to AIDS from 1984 to April 1987. *BMJ* 1988;296:1289-92.

(Accepted 18 April 1991)

HIV surveillance: the value of audit

Matthew Hickman, John Aldous, John Porter, Linda Durman

Department of Public Health, Riverside Health Authority, London SW6 4UL

Matthew Hickman, BSC, district HIV information officer

John Aldous, MRCP, registrar in public health medicine

Linda Durman, MFPHM, director of public health

Public Health Laboratory Service Communicable Disease Surveillance Centre, London NW9 5EQ

John Porter, MFPHM, consultant in public health medicine

Correspondence to: Mr Hickman.

BMJ 1991;302:1376-7

Surveillance of the HIV epidemic in England and Wales relies on two national voluntary reporting systems run by the Public Health Laboratory Service Communicable Disease Surveillance Centre: one for cases of AIDS, the other for positive results of HIV antibody tests. The Communicable Disease Surveillance Centre collates this information and identifies duplicate reports to form anonymised national databases of cases of AIDS and patients positive for HIV. In future this form of surveillance will be supplemented by the unlinked anonymous testing programme.¹

Although several studies have shown underreporting of cases of AIDS,²⁻⁴ little is known of the effectiveness of the national surveillance of results of tests for HIV antibody. We evaluated the reporting of these results from Riverside Health Authority.

Subjects, methods, and results

We identified 14 sources of information on people infected with HIV in the district (table). From July to September 1989 we collected data from these sources, entered them on to a computerised database, and cross checked them for duplicate reporting. We reviewed case notes if there were insufficient data to identify duplicate reports or to confirm HIV infection if the result of an HIV antibody test had not been recorded. If case notes were unobtainable or contained no record of HIV infection we removed that record from the database.

We compared the number of subjects with a positive result of an HIV antibody test performed in the district with the number attributed to the district by the national surveillance system up to July 1989.

The study identified 2867 people with HIV infection (table); 2808 had a record of a positive result of an HIV antibody test performed in the district. The Communicable Disease Surveillance Centre had records of 1861 people with a positive result reported from Riverside. Therefore 947 either had not been reported or had been first reported from another district health authority.

In Riverside one laboratory did not report positive test results to the Communicable Disease Surveillance Centre, and one genitourinary clinic used a reference laboratory for primary testing for HIV antibody which also did not report its positive results. Together these sources were responsible for 621 of the positive results identified by this study. We reported test results from these two sources to the Communicable Disease Surveillance Centre, which accepted 617 as being reported for the first time and retrospectively incorporated them into the national figures. This increased the number of people with a positive test result attributed to Riverside by 33% and the total for England and Wales by 6%. The remaining positive results were checked further by the Communicable Disease Surveillance Centre to identify any that had not been reported previously.

Comment

Underreporting of positive results of HIV antibody tests reduces the usefulness of the national surveillance system as a means of monitoring changes in the HIV epidemic and of planning effective prevention strategies. This study showed that between 22% and 34% of the positive results of tests performed in Riverside had not been reported to the Communicable Disease Surveillance Centre. Although this scale of underreporting may be peculiar to Riverside, we recommend that all health authorities should audit their reporting of positive results. An essential first step is to ensure that each laboratory undertaking primary testing for HIV antibody is reporting to the national surveillance system.

Furthermore, it is important that laboratories

Sources of data used in Riverside Health Authority

	No of data sources	Type of data source	No of records
Genitourinary clinic	2	Computerised database of patients with HIV infection	2300
	1	File register of patients with HIV infection	457
	1	List of patients with HIV infection in 1987	193
	1	List of cases of AIDS reported to Communicable Disease Surveillance Centre	226
Microbiology laboratory	1	Computerised database of tests for HIV antibody	1923
	2	Register of tests for HIV antibody	664
Hospital inpatients	1	Patient administration system	215
	1	Hospital ward book	156
	1	List of inpatients with HIV infection	160
	1	List of cases of AIDS reported to Communicable Disease Surveillance Centre	119
Other	1	List of patients with HIV infection in 1985	32
	1	Computerised database of death certificates	288
No of records collected			6733
No of duplicates			3866
No of people with HIV infection			2867