

# Trends in incidence of AIDS associated with transfusion of blood and blood products in Europe and the United States, 1985-93

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## Abstract

**Objective**—To quantify patterns and trends in incidence of AIDS associated with transfusion of blood and its products in 14 European countries and the United States.

**Design**—Data were derived from the World Health Organisation's European non-aggregate AIDS dataset and, for the United States, from the Centers for Disease Control AIDS public information dataset. Rates were standardised by using the world standard populations and adjusted for reporting delays in each country.

**Subjects**—Cases of AIDS in patients with haemophilia and recipients of transfusions.

**Results**—Overall, between 1985 and 1993 almost 6000 cases of AIDS associated with transfusions were registered in the 14 European countries considered and over 8000 in the United States between 1985 and 1992. Most European countries had annual age adjusted rates lower than 0.5 per million children aged 12 or less and between 1 and 2 per million adults. The United States had rates around 1 per million children and 5 per million adults in the most recent period. For children, the highest rates were generally reached in 1985-7, whereas in adults the highest rates were in the late 1980s. France had the highest overall incidence of AIDS related to transfusion in Europe (3.3 per million). Romania had a major epidemic in children (over 30 cases per million children in 1988-90). Incidence rates of AIDS associated with transfusion were still increasing in some southern European countries in the early 1990s.

**Conclusions**—Apart from in France and Romania it is clear that rates of bloodborne AIDS in European countries are lower than those registered in the United States.

## Introduction

The issue of AIDS transmission through blood and its products has been recognised since the early 1980s, before the identification of the causative agent, HIV.<sup>1</sup> Between 1983 and 1985 major steps were taken to control a bloodborne HIV epidemic,<sup>2</sup> but the schedules and the degree of adoption of these measures have been different in various European countries as compared with in the United States.<sup>3-10</sup>

Although several problems—for example, under-reporting, inaccuracies in HIV transmission categories, lack of information on the timing of and reason for transfusion, etc—hamper the comparison of incidence of AIDS in different areas, this report represents an attempt to assess systematically cases of AIDS in haemophilic patients and transfusion recipients in different European countries and, for a comparison, in the United States in terms of age standardised incidence rates.

## Materials and methods

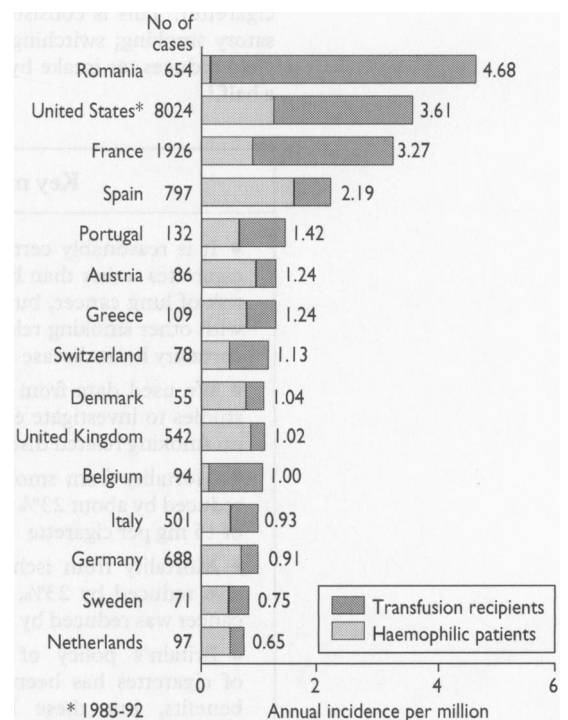
For European countries, official AIDS notification data for the period 1985-93 were derived from the European non-aggregate AIDS dataset (ENAADS) up

to March 1994. Data on the United States were derived from the AIDS public information dataset (PIDS) up to June 1993.<sup>11-15</sup> Countries which in the examined period reported fewer than 50 bloodborne AIDS cases or did not send disaggregated data to ENAADS were not included. Rates were standardised for age<sup>10,16</sup> and corrected for reporting delay<sup>7,17</sup> in each country.

## Results

Table 1 gives the number of cases of AIDS associated with blood and its products in various countries overall and by sex, age group, and transmission category (transfusion recipients and patients with haemophilia). Data are adjusted for delays in reporting. The figure shows the number of cases and age adjusted rates of bloodborne AIDS over the period 1985-93 in the 14 European countries considered and the United States, together with proportions of haemophilic patients and transfusion recipients. The burden of HIV infection was especially heavy in transfusion recipients in France and in Romania, where they accounted for 74% and 98%, respectively, of cases associated with blood or its products.

Table 2 shows annual incidence rates in children aged 0-12 years and adults and by HIV transmission category for three subsequent calendar periods. In children the highest rates were generally observed in 1985-7 or 1988-90 and declined thereafter. In 1991-3 three European countries, besides Romania, showed incidences above 0.5 per million children: France, Portugal, and Belgium. In adults, France showed



Total number and age standardised annual incidence rates of cases of AIDS associated with blood and blood products per million by country and transmission category, 1985-93

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**Table 1**—Distribution of AIDS cases associated with blood and blood products by country, sex, age, transmission category, and percentages of total AIDS cases, 1985-93

Country	Sex		Age (years)			Transmission category		Proportion of total AIDS cases (%)
	Male	Female	0-12	13-49	≥ 50	Haemophilic patients	Transfusion recipients	
Austria	69	17	5	65	16	60	26	7.5
Belgium	49	45	11	57	26	9	85	6.0
Denmark	43	12	0	37	18	34	21	4.0
France	1213	713	95	949	881	417	1509	5.9
Germany	552	136	23	471	193	431	257	5.7
Greece	90	19	9	79	21	67	42	12.2
Italy	393	108	25	357	119	230	271	2.3
Netherlands	77	20	11	55	31	55	42	3.2
Portugal	99	33	11	89	32	50	82	6.1
Romania	374	280	630	20	4	13	641	23.9
Spain	655	142	65	557	175	529	268	2.8
Sweden	59	12	2	26	43	32	39	7.2
Switzerland	54	24	2	44	32	25	53	1.9
United Kingdom	466	76	26	411	105	439	103	5.7
United States*	5777	2246	493	4308	3223	2401	5623	2.8

\*1985-92.

**Table 2**—Annual incidences of AIDS cases associated with blood and blood products per million (age standardised, world) by country, age group, transmission category, and time

Country	Children (0-12 years)			Adults			Haemophilic patients			Transfusion recipients		
	1985-7	1988-90	1991-3	1985-7	1988-90	1991-3	1985-7	1988-90	1991-3	1985-7	1988-90	1991-3
Austria	0.53	0.76	0.00	0.94	1.71	1.98	0.62	0.95	1.18	0.21	0.50	0.26
Belgium	0.25	1.28	0.50	0.82	1.17	1.38	0.00	0.23	0.15	0.66	0.98	0.99
Denmark	0.00	0.00	0.00	1.17	1.27	1.89	0.67	0.52	0.98	0.18	0.40	0.39
France	1.11	0.90	0.74	2.29	5.10	5.05	0.39	1.00	1.15	1.58	2.95	2.72
Germany	0.34	0.14	0.13	0.79	1.34	1.39	0.47	0.74	0.63	0.20	0.27	0.41
Greece	0.27	0.53	0.45	0.89	1.81	1.97	0.51	0.78	1.04	0.21	0.68	0.51
Italy	0.27	0.32	0.18	0.53	1.29	1.74	0.27	0.53	0.61	0.19	0.49	0.70
Netherlands	0.40	0.32	0.37	0.29	0.96	1.03	0.11	0.46	0.57	0.20	0.33	0.28
Portugal	0.57	0.37	0.53	0.61	2.23	2.50	0.46	0.67	0.59	0.15	1.05	1.37
Romania	0.00	33.89	16.11	0.08	0.12	0.27	0.03	0.12	0.09	0.03	9.25	4.52
Spain	0.88	1.01	0.31	1.32	3.34	3.56	0.94	1.95	1.69	0.26	0.75	0.98
Sweden	0.18	0.19	0.00	0.99	1.29	0.65	0.34	0.47	0.38	0.43	0.52	0.09
Switzerland	0.00	0.25	0.28	0.45	2.14	1.88	0.15	0.67	0.56	0.18	0.95	0.89
United Kingdom	0.29	0.21	0.27	0.80	1.68	1.44	0.51	1.10	0.88	0.15	0.18	0.24
United States*	1.08	1.15	0.74	3.51	5.38	5.02	0.84	1.41	1.44	2.01	2.82	2.40

\*1985-92.

the highest incidence rates over the examined period, similar to those seen for the United States. Adult incidence rates peaked in 1988-90 in Sweden, Switzerland, and the United Kingdom, as well as in France and the United States. Conversely, no clear decline was seen in other European countries, and upward trends persisted up to 1991-3 in Denmark, Italy, Portugal, and Spain. The separate inspection of data on haemophilic patients and transfusion recipients revealed generally consistent patterns. Recent declines in the numbers of AIDS cases associated with transfusions were seen in France and the United States, whereas an upward trend persisted in several southern European countries.

### Discussion

AIDS linked to blood and blood derivatives has been a major problem in Europe, at least up to the mid-1980s. Two European countries emerged with substantial excesses of AIDS cases. One was Romania, where the spread of AIDS among children was due to misuse of blood, blood products, and reusable non-sterilised needles (that is, nosocomial infection).<sup>5,6</sup> The other was France, partly on account of the delay by French government officials in approving an American made blood test for HIV infection.<sup>3,4</sup>

It is clear that transfusion recipients and haemo-

philic were differently represented in various countries on account of different degrees of safety achieved in blood supplies (generally from local donors) and supplies of factor VIII (mostly imported). The former accounted for more than 60% of cases of bloodborne AIDS in Belgium, Portugal, Switzerland, and France. Haemophilic patients predominated over transfusion recipients (>60%) in Denmark, Germany, Spain, and, most notably, in the United Kingdom.

The declines or at least the levelling off of rates of AIDS cases diagnosed in haemophilic patients and transfusion recipients in most European countries since the early 1990s, also in the lack of information on year of transfusion, is evidence of the favourable impact of control procedures and treatment of blood and its products from 1984 onwards.<sup>2</sup> As in the United States<sup>9</sup> improvements were seen earlier in children largely because they have the shortest incubation period between infection and AIDS diagnosis<sup>18-21</sup> and partly on account of the constraints of the incubation period imposed on this group by the definition of the age limit of 12 years. Some less encouraging patterns are, however, present among adults, with persisting upward trends in Denmark, Italy, and Spain.

Apart from France and Romania it is, however, clear that rates of bloodborne AIDS in other examined European countries are lower than those registered in the United States.

## Key messages

- Major differences exist among European countries in the timing and degree of adoption of measures to control a bloodborne HIV epidemic
- Despite many weaknesses, official AIDS notification data help in understanding the size of the problem in Europe and the United States
- Annual age adjusted incidence rates of bloodborne AIDS for 1985-93 were over 3 per million in Romania, the United States, and France
- Rates were lower than 1 per million in Italy, Germany, Sweden, and the Netherlands
- Declines in incidence of bloodborne AIDS in Europe and the United States started in the late 1980s (children) and early 1990s (adults)

Data from the European non-aggregate AIDS dataset (ENAADS), version AIDS9403.DAT, prepared by the European Centre for the Epidemiological Monitoring of AIDS in Paris, was used in this study. Compilation of this data file was made possible by the continuing participation of clinical doctors in mandatory and voluntary national reporting schemes for AIDS cases. We wish to thank the National Center for Infectious Diseases, Centers for Disease Control and Prevention (CDC), Atlanta, for AIDS public information dataset updated to June 1993; Dr Eva Negri for useful comments; Mrs Luigina Mei for editorial assistance; and Dr Angelo Lo Re and Mr Roberto Ricci for technical assistance.

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**Conflict of interest:** None.

1 Centers for Disease Control. Possible transfusion-associated acquired immune deficiency syndrome (AIDS)—California. *MMWR Morb Mortal Wkly Rep* 1982;31:652-4.

- 2 Ness PM, Nass CC. Blood donor testing for HIV-I/II and HTLV-I/II. *Arch Pathol Lab Med* 1994;118:337-41.
- 3 Anderson C. AIDS scandal indicts French government. *Nature* 1991;353:197.
- 4 Bader J-M. France: doctors face charges over HIV-infected blood. *Lancet* 1992;340:360.
- 5 Hersh BS, Popovici F, Apetrei RC, Zolotuska L, Beldescu N, Calomfirescu A, et al. Acquired immunodeficiency syndrome in Romania. *Lancet* 1991;338:645-9.
- 6 Patrascu IV, Dumitrescu O. The epidemic of human immunodeficiency virus infection in Romanian children. *AIDS Res Hum Retroviruses* 1993;9:99-104.
- 7 Dal Maso L, Franceschi S, Negri E, Serraino D, La Vecchia C, Ancelle-Park RA. Trends of AIDS incidence in Europe and the United States. *Soz Präventivmed* 1995;40:239-65.
- 8 Selik RM, Ward JW, Buehler JW. Trends in transfusion-associated acquired immune deficiency syndrome in the United States, 1982 through 1991. *Transfusion* 1993;33:890-3.
- 9 Selik RM, Ward JW, Buehler JW. Demographic differences in cumulative incidence rates of transfusion-associated acquired immunodeficiency syndrome. *Am J Epidemiol* 1994;140:105-12.
- 10 Franceschi S, Dal Maso L, La Vecchia C, Negri E, Serraino D. AIDS incidence rates in Europe and the United States. *AIDS* 1994;8:1173-7.
- 11 Centers for Disease Control. Revision of the case definition for acquired immunodeficiency syndrome. *MMWR Morb Mortal Wkly Rep* 1985;34:373-5.
- 12 Centers for Disease Control. Revision of the CDC surveillance case definition for acquired immunodeficiency syndrome. *MMWR Morb Mortal Wkly Rep* 1987;36:3-15S.
- 13 World Health Organisation. Acquired immunodeficiency syndrome (AIDS)—WHO/CDC case definition for AIDS. *Wkly Epidemiol Rec* 1986;61:69-76.
- 14 World Health Organisation. Acquired immunodeficiency syndrome (AIDS)—1987 revision of CDC/WHO case definition for AIDS. *Wkly Epidemiol Rec* 1988;63:1-8.
- 15 European Centre for the Epidemiological Monitoring of AIDS. *AIDS surveillance in Europe*. No 37. Paris: Hospital Saint-Maurice, 1993.
- 16 Doll R, Smith PG. Comparison between registries: age-standardized rates. In: Waterhouse J, Muir C, Shanmugaratnam K, Powell J, eds. *Cancer incidence in five continents*. Vol IV. Lyons: International Association for Research on Cancer, 1982:58-88. (Scientific publication No 42.)
- 17 Rosenberg PS. A simple correction of AIDS surveillance data for reporting delays. *J Acquir Immune Defic Syndr* 1990;3:49-54.
- 18 Goedert JJ, Kessler CM, Aledort LM, Biggar RJ, Andes WA, White GC II, et al. A prospective study of human immunodeficiency virus type 1 infection and the development of AIDS in subjects with hemophilia. *N Engl J Med* 1989;321:1141-8.
- 19 Ward JW, Bush TJ, Perkins HA, Lieb LE, Allen JR, Goldfinger D, et al. The natural history of transfusion-associated infection with human immunodeficiency virus. Factors influencing the rate of progression to disease. *N Engl J Med* 1989;321:947-52.
- 20 Medley GF, Anderson RM, Cox DR, Billard L. Incubation period of AIDS in patients infected via blood transfusion. *Nature* 1987;328:719-21.
- 21 Blaxhult A, Granath F, Lidman K, Giesecke J. The influence of age on the latency period to AIDS in people infected by HIV through blood transfusion. *AIDS* 1990;4:125-9.

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## Prognostic trees to aid prognosis in patients with cutaneous malignant melanoma

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### Abstract

**Objectives**—To design user friendly guides to prognosis for patients who have had invasive primary cutaneous malignant melanomas surgically excised.

**Design**—Adaptation of the classification tree method was used to derive prognostic trees for four different subgroups of malignant melanoma patients in whom known and possible prognostic variables interacted in different ways.

**Setting**—Scotland.

**Subjects**—Statistical modelling for prognostic trees was based on 1978 patients whose primary malignant melanoma was first diagnosed in 1979-86 for whom five year follow up and all relevant clinical pathological data were available. The resultant model was validated with 300 patients first diagnosed in 1987 for whom the same information was available.

**Main outcome measures**—Actual and predicted rate of survival after diagnosis of primary cutaneous malignant melanoma.

**Results**—The four subgroups of patients were men and women with ulcerated and non-ulcerated cutaneous primary melanomas. Validation of the model showed excellent agreement between actual

status of patients in the relevant subgroups and their status as predicted by the model.

**Conclusions**—The prognostic trees are simple to use and give more accurate prognosis for individual patients than is currently available from tumour thickness alone.

### Introduction

Studies have shown that several factors affect the prognosis and survival of patients with primary invasive cutaneous malignant melanoma.<sup>1-4</sup> Most reports agree that tumour thickness is the most important prognostic factor, but several other factors seem to interact, including sex, presence or absence of ulceration, level of invasion, age at diagnosis, site of tumour, and type of tumour.

We previously reported the results of proportional hazards models developed by the Scottish Melanoma Group to predict survival of patients with primary cutaneous malignant melanoma.<sup>5</sup> Four distinct subgroups of patients were identified from this analysis—men and women with ulcerated or non-ulcerated lesions. Within each of these subgroups different sets of prognostic factors were identified, although tumour thickness was always a key factor. For example, among

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