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HIV-AIDS Transmission Symbols

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As THE AIDS PANDEMIC has gained momentum in this and many other lands, and as the principal mechanisms for the transmission of the human immunodeficiency virus (HIV) have been identified (*1-4*), there has come a need for a set of symbols to indicate each mechanism of HIV transmission and track its spread. If soundly devised, such symbols might have utility for HIV-AIDS communications and control programs, somewhat analogous to the utility of international traffic signs.

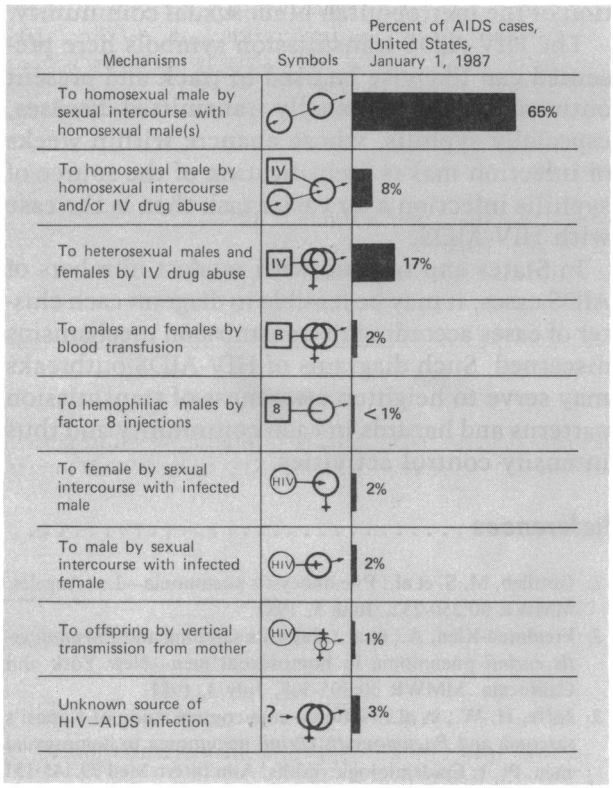
For this purpose I propose adaptation of the symbols commonly used to denote male ♂ and female ♀, and diverse permutations of same, while adhering to several simple rules: each circle ○ indicates a body (person), designated as male ♂ or female ♀; with the left-hand symbol indicating the source of HIV-AIDS infection, and the right-hand symbol indicating the recipient of HIV-AIDS. Notations within circles indicate the status of individuals: (HIV) — one infected with HIV, (A) one with AIDS, (P) — a prostitute; or they indicate transmission dynamics: ⊖ — one infected by male sexual intercourse, and ⊕ — one infected by female sexual intercourse. Hence, ○—⊖♂ denotes a male infected with HIV by homosexual intercourse; ○—⊕♂ denotes a male infected with HIV by heterosexual intercourse; and ○—⊖—⊖♀ denotes a female infected with HIV by heterosexual intercourse with a bisexual male infected by homosexual intercourse. A square □ denotes nonsexual transmission of HIV-AIDS: [IV] by IV drug abuse, [N] by contaminated needles, [B] by blood transfusion, or [8] by factor 8 injection.

Vertical (in-utero) transmission of HIV is indicated by attachment of a small body to the female symbol and indicating the sex of the offspring ○—♂. Permutations of such symbols or ideograms are presented in figure 1, identifying the percentage of U.S. AIDS cases through January 1, 1987 resulting from each transmission mechanism.

Application of these symbols to the tracking and presentation of a hypothetical epidemic of HIV-AIDS derivative of one male homosexual is presented in figure 2. It does not show the many additional sexual cross-connections which ordinarily obtain among promiscuous homosexual males during the latent years between HIV infection and AIDS onset; these usually frustrate searches for specific sources of infection—especially in New York, San Francisco, and other communities where AIDS is epidemic.

In figure 3, transmission symbols are applied to the tracking and presentation of hypothetical, inter-related outbreaks in an African society—where common use of HIV-contaminated needles for medical injections, frequent transfusions of blood containing HIV, promiscuous sexual intercourse with HIV-infected female prostitutes, marital and extramarital sexual intercourse with HIV-infectees, and vertical transmission of HIV from infected mothers to offspring, combine to produce

Figure 1. Key to symbols for HIV transmission mechanisms



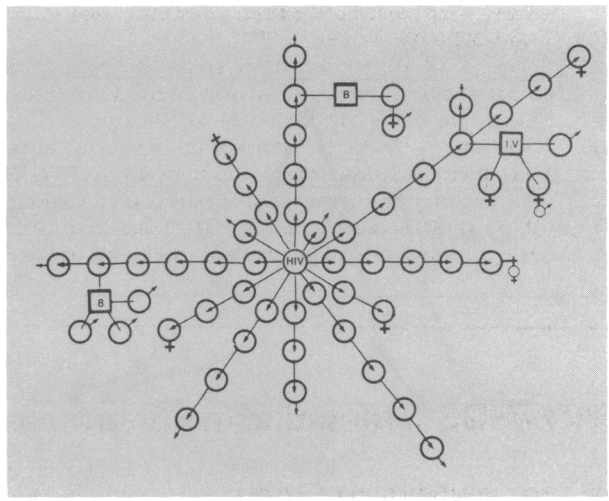
SOURCE: AIDS Weekly Surveillance Report, United States, Jan. 5, 1987, Centers for Disease Control, Atlanta, GA.

high and roughly equal rates of HIV-AIDS among males and females (*5*).

The principal etiologic role of human immunodeficiency virus is now clear (*6-8*), though the role of diverse cofactors remains obscure (*9,10*). There is increasing awareness that the average latent interval from HIV infection to AIDS onset is very long—perhaps almost a decade—as suggested by the comparative ages of persons with hepatitis B and AIDS cases in the U.S. population (figure 4). Hence, evidence of widespread HIV infection among IV drug abusers in the United States in 1971-72 (*11*) should not be summarily discounted. Rather, it is conceivable that the epidemic increase of HIV in the United States during the 1970s paralleled that of hepatitis B virus; and investigations of AIDS infection sources should encompass all sexual and blood exposures during at least the prior decade—though the exact source of HIV infection is usually impossible to pinpoint for those with many hazardous exposures (figure 5). Such clock-calendar recording of sexual experience by month may be useful for clinicians and researchers when seeking to obtain a thorough history.

The homosexuals with AIDS identified during 1981 averaging more than 1,000 prior sexual partners (*2,3*), may have been exposed to HIV infections derivative of a quarter-million prior sexual partners (1,000 ÷ 2 x 1,000 ÷ 2 = 250,000). (The

Figure 2. Hypothetical HIV–AIDS epidemic derived from one male homosexual



Interpretation: 12 male HIV infections by homosexual intercourse with index male; 29 male HIV infections by homosexual intercourse with descendent infectees; 5 female HIV infections by heterosexual intercourse with descendent male infectees, plus 1 offspring HIV infection by vertical transmission, 3 HIV infections (2 male, 1 female) by IV drug abuse, plus 1 offspring HIV infection by vertical transmission; 3 HIV infections of hemophiliac males by Factor 8 injection; 1 female HIV infection by blood transfusion, plus 1 male infection by heterosexual intercourse with transfusion infectee—for a total of 56 HIV infections (47 adult males, 7 adult females, 2 children).

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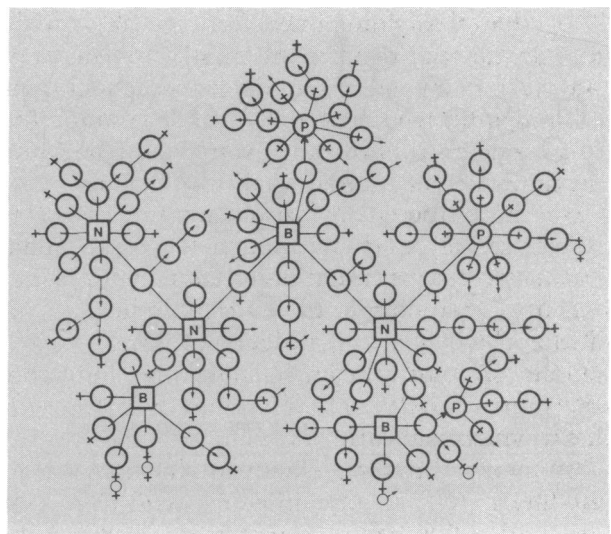
Figure 3. Illustrative diagram of hypothetical HIV–AIDS epidemic in Africa



N = Contaminated needles B = Blood transfusion P = Prostitute

Interpretation: 12 male and 12 female HIV infections from contaminated needles; 3 male and 8 female HIV infections from sexual intercourse with needle infectees; 9 male and 10 female HIV infections from blood transfusions; 6 male and 8 female HIV infections by sexual intercourse with transfusion infectees; 17 male HIV infections by sexual intercourse with 3 female prostitutes; 11 female HIV infections by sexual intercourse with prostitute infectees; 5 child HIV infections by vertical transmission—for a total of 104 HIV infections (47 males, 52 females, and 5 children).

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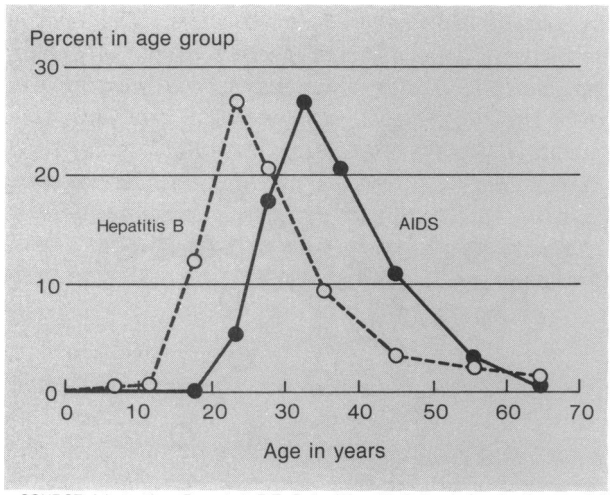
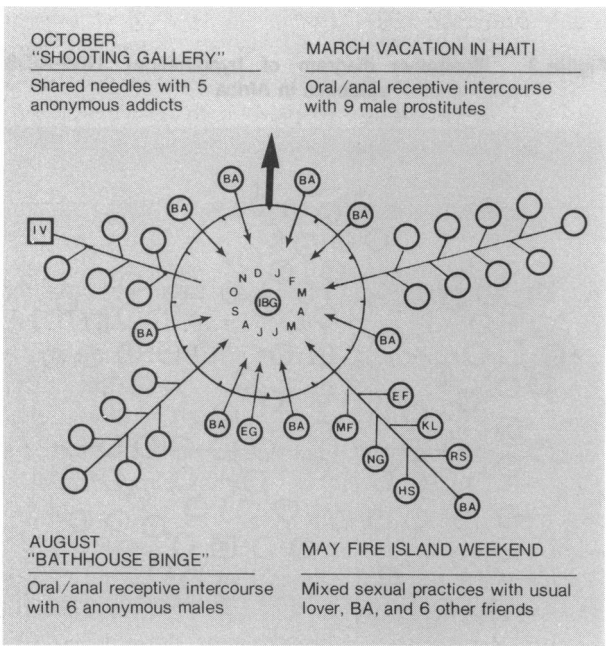
Figure 4. Age distribution of persons with cases of hepatitis B, 1981, and AIDS, 1978–83, United States



SOURCE: Adapted from Ravenholt, R.T.: Role of Hepatitis B virus in Acquired Immunodeficiency Syndrome. Lancet 2:885-886, Oct. 15, 1983.

Figure 5. Illustrative diagram of a year in the life of a promiscuous New York male homosexual: clock calendar presentation of HIV hazard experience by month, 1980



Interpretation: New York male homosexual practiced insertive and oral/anal (o/a) receptive intercourse with his male lover, BA, throughout 1980; had o/a receptive intercourse with 9 male prostitutes in Haiti in March; had mixed sexual practices with BA and 6 other friends on Fire Island one weekend in May; had o/a receptive intercourse with 6 anonymous males during "Bathhouse Binge" in August; shared needles with 5 anonymous addicts in "Shooting Gallery" in October; had o/a receptive intercourse with EG, friend of BA, in July.
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total number of sexual partners halved equals the average number of prior sexual partners before the average sexual encounter). Hence, indirectly through prior sexual connections, each "cruising" male homosexual in New York City was exposed to HIV infections derivative of a very large proportion of the metropolitan homosexual community.

The HIV-AIDS transmission symbols here presented can likewise be used to track and present outbreaks of other sexually transmitted diseases, especially syphilis, whose chancre within weeks of infection makes identification of the source of syphilis infection a far easier task than is the case with HIV-AIDS.

In States and nations with modest numbers of AIDS cases, it may be feasible to diagram each cluster of cases according to transmission mechanisms discerned. Such diagrams of HIV-AIDS outbreaks may serve to heighten awareness of transmission patterns and hazards in each community and thus intensify control activities.

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