



# American Journal of EPIDEMIOLOGY

Volume 137

Number 2

January 15, 1993

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School of Hygiene and Public Health

Sponsored by the Society for Epidemiologic Research

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## ORIGINAL CONTRIBUTIONS

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### Trends in the First Ten Years of AIDS in New York City

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With over 37,000 cases of acquired immunodeficiency syndrome (AIDS) reported by the end of 1991, New York City had reported nearly 20% of all US cases in the first decade of the AIDS epidemic. This report examines cases diagnosed through 1990 and reported through 1991 to describe rates and trends in the affected subpopulations. Case data were collected by the New York City Department of Health AIDS Surveillance Team, using a format standardized by the federal Centers for Disease Control. Deaths attributable to human immunodeficiency virus (HIV) infection were examined using data provided by the New York City Department of Health Bureau of Vital Statistics. From 1981 through 1990, 37,436 cases of AIDS were diagnosed: 83% in men over the age of 19 years, 15% in women over 19, 2% in children under 13, and less than 1% in teenagers aged 13–19. Cumulative rates in New York City adults were as high as 100 per 10,000 in nine neighborhoods. Predominant trends included a sustained plateau in reported incidence in men who reported having sex with men and a continuing rise in cases in injection drug users and women infected through heterosexual intercourse. HIV-related deaths in men, women, and children were continuing to rise at the end of the decade. During the first decade of the AIDS/HIV epidemic, case surveillance in New York City measured the visible portion of the epidemic and provided important data on subepidemics. *Am J Epidemiol* 1993;137:121–33.

acquired immunodeficiency syndrome; HIV; homosexuality; risk; sex behavior; substance abuse, injection; surveillance

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The acquired immunodeficiency syndrome (AIDS) epidemic, first described in 1981 in New York City and California, con-

tinued to grow during the subsequent decade (1, 2). In large metropolitan areas, the epidemic influenced many aspects of public

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Received for publication March 11, 1992, and in final form September 8, 1992.

Abbreviations: AIDS, acquired immunodeficiency syndrome; CDC, Centers for Disease Control, HIV, human immunodeficiency virus

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health and health care delivery. New York City, with over 37,000 reported cases by the end of 1991, had more AIDS cases than the next four most severely affected US municipalities combined, and was second only to San Francisco in cumulative number of cases per 10,000 population (3). Representing over 40 percent of US cases in the first half of the 1980s, by 1991 the cumulative incidence in New York City represented 19 percent of the US total, as the epidemic spread and grew in other large and small municipalities and in rural America (4). An examination of the evolution of the AIDS epidemic in New York City can provide insight into the scope and character of the future pattern of AIDS and HIV incidence in other North American cities during the 1990s.

The overall epidemic of AIDS can best be understood as a number of concurrent but overlapping epidemics delineated by type of risk. Originally recognized in 1981 in men who reported having sex with men, by the end of 1982 AIDS had been diagnosed in injection drug users, the female sex partners of male injection drug users, children born to parents at risk, blood transfusion recipients, and persons with hemophilia (1, 5–10). The disease was also found to be prevalent in heterosexual men and women from certain Caribbean and African countries who reported neither injection drug use nor homosexual sex (11, 12). Many of the behaviors that are now firmly associated with AIDS were first described in New Yorkers.

While it is now well understood that there can be a years-long asymptomatic phase of human immunodeficiency virus (HIV) infection, a cornerstone in public understanding of the epidemic continues to be the monitoring, through surveillance, of AIDS, the specific set of diseases often characteriz-

ing the terminal stages of HIV infection. Surveillance for AIDS in New York City, funded jointly by the federal Centers for Disease Control (CDC) and the City, remained an active process during the first 10 years of the epidemic (1–3). Surveillance continues to be one way to monitor unusual modes of transmission. However, its usefulness has evolved more as a way to measure the relative burden of the epidemic among population groups and to monitor trends in the epidemic. With some exceptions, due to changing diagnostic techniques, AIDS surveillance has monitored the same HIV-related opportunistic diseases over a long period, allowing trends in the epidemic to be evaluated (2).

At the beginning of the 1980s, when the AIDS epidemic was recognized, it seemed most prevalent in men who reported having sex with men and loomed as a terror for many of these men. At the close of the decade, AIDS was known to have stricken many others as well, and had become a city-wide tragedy for many poor families, especially those with members using illicit drugs. This paper chronicles the decade-long trends in AIDS incidence as it has been observed through the New York City Department of Health AIDS surveillance system.

## MATERIALS AND METHODS

### AIDS case surveillance

AIDS surveillance is conducted in New York City by a team of New York City Department of Health field workers. A contact person identified in each hospital or institution is called or visited periodically, and provides the Department of Health field worker with a list of probable cases. A second smaller list is derived from New York City death certificates listing AIDS as the cause of death in persons not previously reported to AIDS surveillance. Data collected on cases include demographic information, type of opportunistic disease, and behavioral or other risk factors with which HIV infection is associated. Basic surveillance techniques have been described in further detail previously (13).

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This project was funded by the Centers for Disease Control and the City of New York.

The authors thank former Health Commissioners Drs David Sencer and Stephen Joseph, Former Deputy Commissioner Dr Stephen Schultz; Assistant Commissioner Dr. Mary Ann Chiasson; and colleagues Ellen Rautenberg, Dr. Rand Stoneburner, Norman Miller, Rosalyn Williams, and Sonny Ly. The authors also thank Sadarryle Young and Juanita Browne for manuscript preparation

Surveillance personnel attempt to ascertain for each case at least one sexual or percutaneous exposure. While all reported risk factors are recorded and entered into the computer, no active attempt is made to find more than one. Methods of ascertainment of risk for cases not at first reported to have any risk factors include interview with medical care providers, periodic chart review, and when possible, interview with the patient and his or her relatives and close associates. A relatively constant proportion of cases—approximately 10 percent—are reported without risk factors.

The source of each report has been recorded for each case since mid-1989. Between July 1989 and December 1991, 77 percent of the reports originated from hospital-based activities largely using lists collected by infection control personnel; 13 percent came from routine ongoing death certificate review; and 5 percent were reported by surveillance personnel in other states, private physicians, outpatient clinics, New York City prisons, and the New York City medical examiner's office. For cases reported via death certificate, as for most cases, a chart review is conducted to verify the diagnosis and to ascertain the date of diagnosis, defined as the earliest date on which criteria for a reportable diagnosis of AIDS were met. In the past 2 years, 5 percent of cases were reported subsequent to review of alternate data sources in studies evaluating completeness of reporting. The alternative data sources have included selected outpatient AIDS clinic rosters; hospital pathology logs reviewed for cases of Kaposi's sarcoma and *Pneumocystis carinii* pneumonia; and selected hospital discharge rosters.

### Changes in the case definition

After surveillance began in 1981, the case definition was modified in 1983, 1985, and 1987 (14–18). The last change was the most extreme, allowing for the first time presumptive rather than biopsy- or culture-confirmed diagnoses. Two HIV-related syndromes, HIV wasting and HIV dementia,

were also added. The newly allowed presumptive diagnoses all require laboratory evidence of HIV infection.

### Data management and analysis

Case information is entered into an AIDS Reporting System data base developed by the Centers for Disease Control. PRODA (19) was used to perform data analysis on AIDS surveillance data. Data reported through December 1991 are analyzed here.

Cases which have more than one risk factor are assigned risk according to a hierarchy built into the CDC computer software, where injection drug use is dominant, followed by sexual exposure, origin in a country designated as Pattern II by the World Health Organization (20), and exposure to blood and blood products. In Pattern II countries, most HIV infection is found in heterosexual men and women, there is prevalent contamination of blood and blood products, and occasional transmission occurs via inadequately sterilized needles and syringes. New York City population statistics from the 1980 US Census are used to calculate case rates (21). Incidence figures are based on numbers of AIDS cases reported by New York City residence. For evaluation of AIDS cases by neighborhood, New York City neighborhoods are defined according to a system which groups zip code areas (22). Neighborhood population size ranges from 13,000 to 290,000, with an average of 140,000 adults.

### Mortality

All causes of death including AIDS are closely monitored in New York City through death certificates. Death certificates must be filed with the Department of Health within 48 hours of death, and mortality files are almost completely up-to-date. Trends in AIDS deaths can be monitored through the coded underlying cause of death, which is entered into a computer registry of New York City deaths. For this analysis, *International Classification of Diseases*, Ninth Revision, codes 042–044 (AIDS and other

HIV-related infections, used since January 1987), 136.3 (*P. carinii* pneumonia), and 279.1 (immunodeficiency, used for AIDS prior to 1987) were considered AIDS-related. Deaths occurring from 1983 through 1989 were examined. For the purposes of this report, the deaths were designated "AIDS-related" to distinguish them from the strictly CDC-defined AIDS cases reported through surveillance.

Deaths designated as AIDS on death certificates overlap with AIDS surveillance by 70 percent. Such deaths meet the AIDS case definition about 80 percent of the time, and 88 percent of those have been reported to surveillance (23). The AIDS-related deaths which do not meet the case definition represent part of the severe HIV spectrum which does not meet CDC surveillance criteria. Approximately 23 percent of AIDS cases known to be deceased have causes other than HIV/AIDS listed as the underlying cause of death (24).

## RESULTS

### Cumulative findings

**Adults.** The 37,436 AIDS cases diagnosed in New York City through December 1990 included 30,899 men aged 20 years or more (83 percent of cases), 5,610 (15 percent) women aged 20 years or more, 65 (<1 percent) teenagers, and 862 (2 percent) children under the age of 13. By December 1991, the cumulative incidence of reported AIDS, based on the number of adults living in New York City in 1980 (21), was 20 per 10,000 women aged 20 years or more, 139 per 10,000 men aged 20 years or more, and 5 per 10,000 children under 13. Rates for adults by neighborhood ranged from a low of 9 per 10,000 to a high of 232 per 10,000. In nine neighborhoods, over 1 percent of all adults had been reported as having AIDS.

Thirty-two percent of men aged 20 or more with AIDS were black, 27 percent were Hispanic, 39 percent were white, and 1 percent were Asians, Pacific Islanders, and American and Alaskan Natives. Among women aged 20 or more with AIDS, 51 percent were black, 33 percent were His-

panic, 15 percent were white, and less than 1 percent were Asians, Pacific Islanders, and Native Americans. Based on the 1980 US Census, AIDS rates per 10,000 population for New York City men aged 20 or more were 220 in blacks, 220 in Hispanics, and 83 in whites; for women, they were 47 in blacks, 40 in Hispanics, and 5 in whites. The racial/ethnic distribution of cases in New York City varied by reported risk behavior. The cumulative racial breakdown by risk factor is shown for men in table 1 and for women in table 2.

Among men, 53 percent of reported cases have been in men who reported having sex with men; 40 percent have been in injection drug users, including 1,288 (10 percent of injection drug users) who also reported having sex with men. The remaining men were from Pattern II countries as designated by the World Health Organization (20), blood transfusion recipients, and men with hemophilia. Eleven men were reported to have AIDS that was attributable to sexual contact with a woman at risk, and 1,332 cases (4 percent of all reported) remained under investigation for risk.

Among women aged 20 years or more, 61 percent had a history of injection drug use, 25 percent had a history of sexual contact with a man at risk (in 90 percent of cases, an injection drug user), and the remainder were from Pattern II countries or were transfusion recipients. Five hundred and forty-one (10 percent) of the women remained without an identified risk factor.

Overall, 49 percent of adult cases were attributed to sexual transmission (heterosexual or male homosexual), 44 percent to injection drug use, and 1 percent to contaminated blood or blood products; 2 percent were in people from Pattern II countries, and for 5 percent, risk had not yet been ascertained. No cases were attributed to occupational exposure, although three possibly occupation-related cases were under investigation at the end of 1991. In addition, no cases were attributed to woman-to-woman sexual transmission, although 99 (2 percent) of the women aged 20 years or more reported having sex with other women.

**TABLE 1. Race/ethnicity of men aged 20 years or more reported with acquired immunodeficiency syndrome (AIDS), by AIDS risk factor, New York City, 1981-1990**

Risk factor	Black	White	Hispanic	Asian/Pacific Islander	Native American/Alaskan	Other	Total (%)
Sex with men at risk	3,515	9,623	3,009	168	3	78	16,396 (53)
Injection drug user and sex with men*	508	394	376	4	2	4	1,288 (4)
Injection drug user*	4,935	1,705	4,529	13	5	42	11,229 (36)
Person from a Pattern II country†	452	1	1	0	0	0	454 (1)
Sex with women at risk	6	4	1	0	0	0	11 (<1)
Blood transfusion	21	65	14	4	0	0	104 (<1)
Received blood products	4	34	6	1	0	0	45 (<1)
No identified risk factor	19	11	10	0	0	0	40 (<1)
Other‡	530	301	457	23	1	20	1,332 (4)
Total (%)	9,990 (32)	12,138 (39)	8,403 (27)	213 (1)	11 (<1)	144 (<1)	30,899

\* Data are not routinely collected on the number of injection drug-using men and women who also report heterosexual contact with a person at risk.

† Persons from countries designated by the World Health Organization as Pattern II, with most cases occurring among heterosexual men and women, prevalent contamination of blood and blood products, and occasional transmission via inadequately sterilized needles and syringes (20).

‡ Includes persons who died before interview, persons who refused to be interviewed (or whose doctor refused), cases still under investigation for risk, and cases pending confirmation of transmission.

**TABLE 2. Race/ethnicity of women aged 20 years or more reported with acquired immunodeficiency syndrome (AIDS), by AIDS risk factor, New York City, 1981-1990**

Risk factor	Black	White	Hispanic	Asian/Pacific Islander	Native American/Alaskan	Other	Total (%)
Sex with men at risk	603	190	576	5	0	12	1,386 (25)
Injection drug user*	1,802	486	1,113	4	1	14	3,420 (61)
Person from a Pattern II country†	165	1	0	0	0	0	166 (3)
Blood transfusion	21	36	7	3	0	0	67 (1)
Received blood products	1	2	1	0	0	0	4 (<1)
No identified risk factor	12	3	11	0	0	0	26 (<1)
Other‡	282	101	149	6	0	3	541 (10)
Total (%)	2,886 (51)	819 (15)	1,857 (33)	18 (<1)	1 (<1)	29 (1)	5,610

\* Data are not routinely collected on the number of injection drug-using men and women who also report heterosexual contact with a person at risk.

† Persons from countries designated by the World Health Organization as Pattern II, with most cases occurring among heterosexual men and women, prevalent contamination of blood and blood products, and occasional transmission via inadequately sterilized needles and syringes (20).

‡ Includes persons who died before interview, persons who refused to be interviewed (or whose doctor refused), cases still under investigation for risk, and cases pending confirmation of transmission.

Ninety-five (96 percent) of these women were injection drug users, three (3 percent) were sexual partners of men at risk, and one had transfusion-associated AIDS.

The proportion of cases in women increased over time from 6 percent between

1979 and 1982 to 10 percent from 1983 to 1986 and to 17 percent from 1987 to 1990. The age distribution among adults increased slightly over the decade, with nearly 50 percent of cases being diagnosed in persons between the ages of 30 and 40. In men, the

median age at diagnosis fluctuated between 35 and 37 from 1981 to 1987, stayed at 38 from 1988 through 1990, and was 39 in 1991. In women, the median age at diagnosis has risen gradually from 32 in 1982 to 36 in 1990 and 1991.

**Teenagers.** Cumulatively, from 1981 to 1991, 65 AIDS cases diagnosed in teenagers (ages 13–19) were reported—20 female (31 percent) and 45 male (69 percent). None were reported from 1979 to 1982, 26 were reported from 1983 to 1986, and 39 were reported from 1987 to 1991. Risk factors reported included 17 males who had had sex with men; 9 females who had had sex with men at risk; 10 injection drug users; 2 people from Pattern II countries; 18 recipients of blood or blood products; and 9 whose risk was not identified.

**Children.** Of the 862 children under age 13 reported with AIDS in New York City, 53 percent were black, 37 percent were Hispanic, and 10 percent were white. Eight hundred and thirty-four cases (97 percent) had known or probable maternal transmission. Twenty-seven (3 percent) had AIDS attributed to transfusion with contaminated blood or blood products, and one was presumed to have been infected through sexual abuse.

Among the parents of the 834 children who had maternally transmitted AIDS, injection drug use was reported in at least the mother in 493 cases (59 percent) and in the father or other sex partner of the mother in 174 cases (21 percent). The father or other sex partner of the mother was reported as bisexual in 8 cases (1 percent). In 58 cases (7 percent), one or both parents were immigrants from a World Health Organization-designated Pattern II country. Two mothers apparently acquired HIV from contaminated transfusions, and 99 cases remained under investigation for risk.

## Trends

**Incidence.** Trends in the epidemic through 1989 are shown in figures 1–3. Figure 1 shows reported cases in men, women, and children by half-year of diagnosis. Teen-

agers are included in the data for men and women. Figures 2 and 3 show incidence by half-year for persons with the most common risk factors. These graphs were not corrected for lag time in reporting, and to minimize the lag effect, we examined only data for cases diagnosed through 1990. Over 85 percent of cases diagnosed in 1990 and expected to be reported would have been reported through December 1991, and are included in this analysis.

Overall, incidence increased steadily through 1988, with the most rapid rise occurring between 1983 and 1986, rising more slowly after 1988 (figure 1). For men, cases plateaued after 1988. For women, a rise continued following 1988. The slight decline in all cases in the second half of 1990 is attributable to lag time in reporting.

An examination of subepidemics in men by risk factor (figure 2) shows that in men who reported sex with men, the rapid rise ended in 1986, with 2,000–2,500 new cases being diagnosed each year since then. The rise in cases in male injection drug users slowed beginning in 1988. The recent rise in cases with other risk factors is partly attributable to the fact that many risk investigations for more recently reported cases have not yet been completed.

In women (figure 3), incidence in injection drug users continued to rise after 1988. Heterosexually transmitted cases in women also continued to increase. As in men, many cases in the category “other risk factors” are still under investigation.

Trends by neighborhood (not shown) reflected the type of risk population observed in each neighborhood. Neighborhoods where incidence continued to rise had high concentrations of injection drug users. Neighborhoods which had many cases in men reporting sex with men are now showing a decrease in incidence.

**Mortality.** AIDS-related deaths in men, women, and children rose annually in New York City through 1990 (figure 4). By 1990, 370 AIDS-related deaths were occurring monthly in New York City. Prior to 1987, 40 percent of male deaths attributed to AIDS were in whites, 30 percent were in blacks,

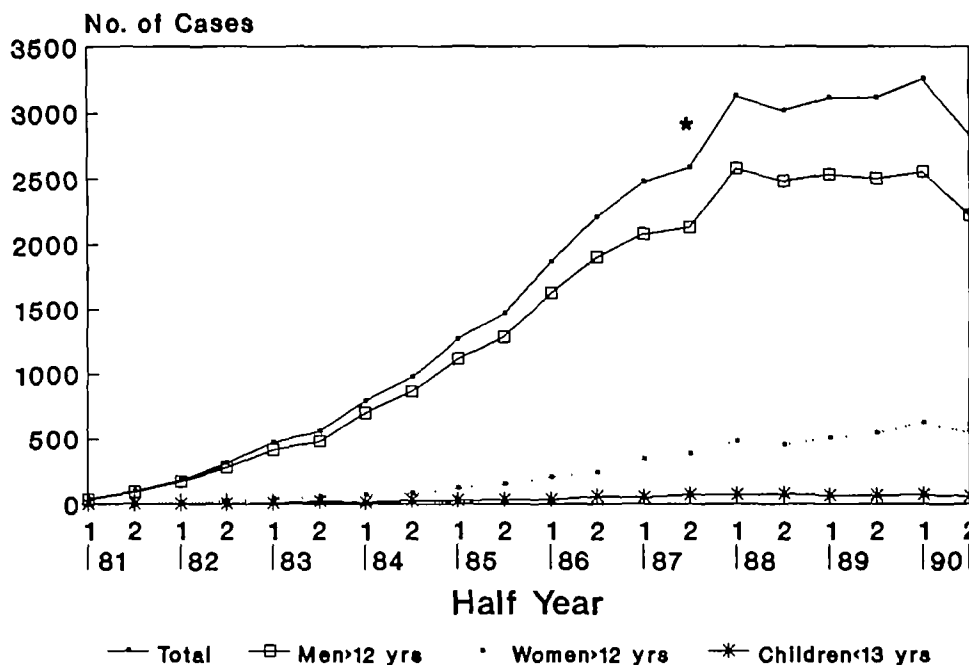


FIGURE 1. Incidence of adult/adolescent acquired immunodeficiency syndrome (AIDS) in men and women and pediatric AIDS, by half-year of diagnosis, New York City, 1981-1990. (\*Case definition expanded in September 1987.)

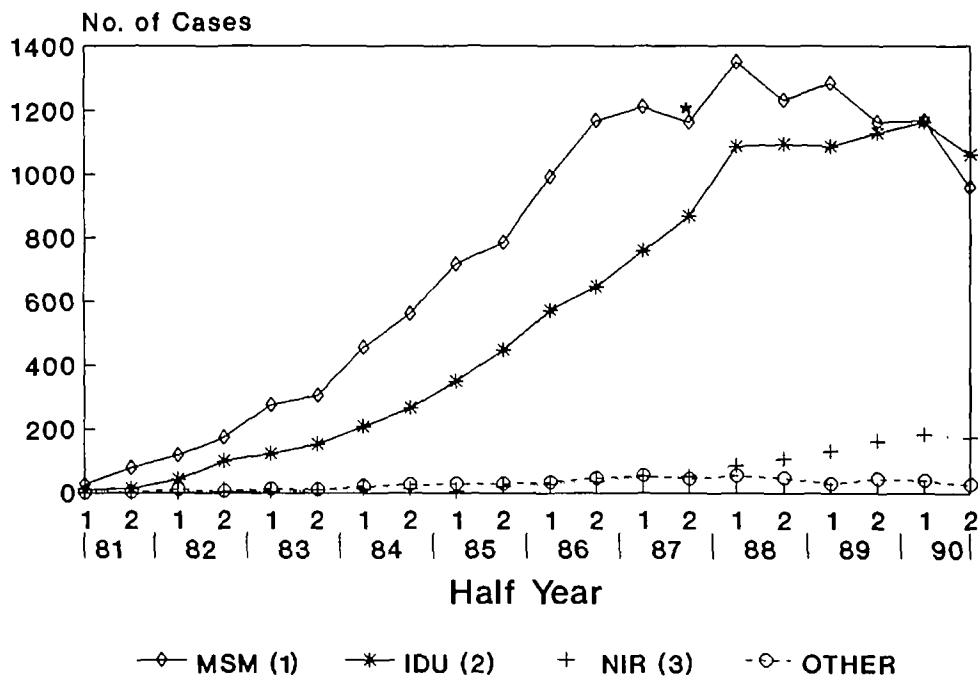
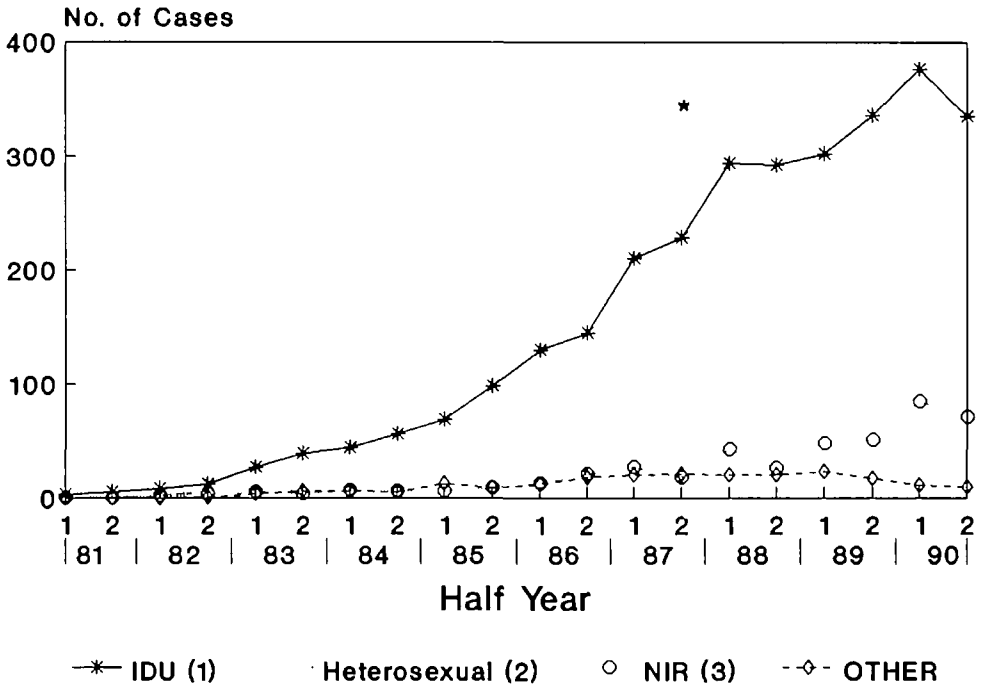
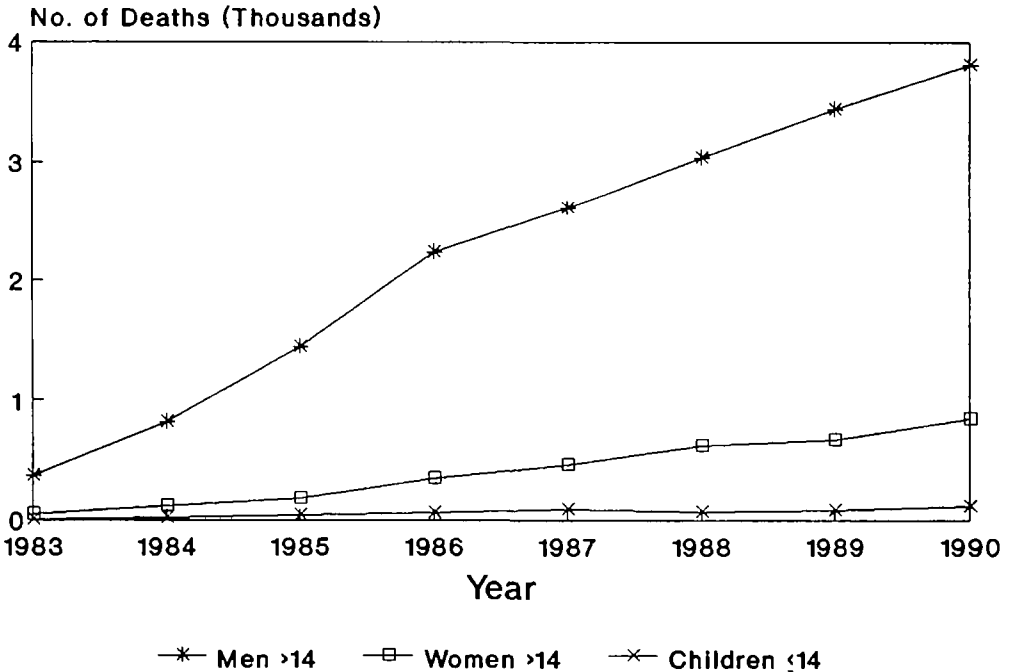


FIGURE 2. Incidence of acquired immunodeficiency syndrome (AIDS) among men aged 20 years or more, by half-year of diagnosis, New York City, 1981-1990. (1), men who reported having sex with men (MSM); (2), injection drug users (IDU); (3), men with no identified risk factors (NIR). (\*Case definition expanded in September 1987.)



**FIGURE 3.** Incidence of acquired immunodeficiency syndrome (AIDS) among women aged 20 years or more, by half-year of diagnosis, New York City, 1981–1990. (1), injection drug users (IDU); (2), women who reported having sex with men at risk for AIDS; (3), women with no identified risk factors (NIR). (\*Case definition expanded in September 1987.)



**FIGURE 4.** Number of deaths related to acquired immunodeficiency syndrome annually in men and women over the age of 14 years and in children aged 14 or less, New York City, 1983–1990. Source of adult data: Office of Vital Statistics, New York City Department of Health.



and 23 percent were in Hispanics. From 1987 to 1990, 34 percent were in whites, 32 percent were in blacks, and 26 percent were in Hispanics. In women, deaths continued to rise, with blacks contributing the largest proportion (48 percent before 1987, 50 percent since) and Hispanics the second largest (29 percent cumulatively).

AIDS is now the third leading cause of death in New York City. It became the leading cause of death in New York City among men aged 25–44 in 1986 and among women aged 25–44 in 1988. For women aged 25–29, it has been the leading cause of death since 1985. Among children, AIDS was the third leading cause of death in children aged 1–14 in 1987 and 1988, the fourth leading cause in 1989, and the second leading cause in 1990 (New York City Department of Health, unpublished data).

## DISCUSSION

The incidence of AIDS diagnosed and reported in New York City increased rapidly from 1982 through 1986 and slowed after 1988. The apparent surge in cases in 1988 followed the September 1987 expansion of the CDC case definition. The expansion allowed counting of some cases that would never have met the old definition, and it is also thought to have caused many cases to become reportable earlier than they otherwise would have been (25).

In examining the concurrent epidemics in New York City according to type of reported risk, it is clear that the predominant sub-epidemics are in men who report having sex with men, injection drug users, women whose heterosexual partners are men with either of the above risk factors, blood transfusion recipients, and children with maternally transmitted infection. Within each subgroup, it is possible to evaluate trends by age, ethnicity, and sex. Major trends include an increasing incidence in women, including injection drug-using women; an increasing incidence in injection drug-using men; and a decreasing incidence of new cases among homosexual/bisexual men, following a pla-

teau in incidence in this group which began in 1986.

There are several hypotheses being considered to explain the leveling off in AIDS cases among men who report sex with men. First, it has been suggested that zidovudine (AZT), prophylactic aerosolized pentamidine, and other new medical therapies may be slowing progression to the severe illnesses that meet the criteria for an AIDS case (26, 27). If so, the individuals for whom this is true may contribute to a rise in cases in the future. However, while zidovudine and *P. carinii* pneumonia prophylaxis may have been widely available to insured AIDS patients as early as 1987, cases in men who reported sex with men plateaued in late 1986, before the availability of zidovudine. This pre-zidovudine leveling has been previously reported for AIDS-related mortality in New York City (28).

A second hypothesis for the early plateau in men who report sex with men is that the rate of new HIV infections in this group began to slow in the mid-1980s as a result of changes in behavior among those at risk. Some evidence for this is provided by recent decreases in the incidence of sexually transmitted diseases in certain groups (29–31). A third possible factor contributing to a plateau is that among HIV-infected men who report having sex with men, many of whom may be middle class with families and homes located outside of New York City, out-migration prior to AIDS diagnosis may blunt the peak of the epidemic curve in New York City. Finally, exhaustion of the available susceptible population of homosexual/bisexual men at highest risk may have contributed to the plateau.

A final theory for explaining the plateauing of AIDS incidence is viral attenuation, a phenomenon that has been observed historically to influence the evolving role of viruses newly introduced into human populations. However, viral attenuation is unlikely to account for epidemiologic trends seen in the AIDS epidemic in its first 10 years in New York City. The long incubation period for HIV illness would delay the appearance of

illness due to an attenuated strain of the virus. Furthermore, there are ample alternative explanations for the observed plateau.

There was a slowing in incidence noted after 1988 in injection drug-using men. No slowing was seen in women. Numbers of cases in children have been stable since 1987, and may reflect the reported stabilization of HIV seroprevalence in newborns in New York City (32). The predominance of AIDS in minority children (90 percent of case children are black or Hispanic) reflects seroprevalence data in New York City newborns born between 1987 and 1990. Ninety percent of those found to be HIV-positive are black or Hispanic (32). The small but increasing numbers of cases in men and women who do not yet have any risk factors assigned are due in large part to a lack of resources for completing these case investigations.

We note that trends in incidence by risk factor are approximated. Risk assignment is inexact, based on medical chart review and not a thorough personal assessment of each case. Although more than one risk factor is recorded for 5 percent of cases, for the most part a complete set of risk factors for each case is not sought. The trends reported here are based on a hierarchy in which injection drug use is dominant, followed by sexual contact with someone at risk and then origin in a Pattern II country and transfusion of blood or blood products. Even with this hierarchy, and with ongoing increases in female injection drug users and no decrease in male injection drug users, sexual exposure (homosexual, between men, and heterosexual, largely to women) remains the dominant risk factor to which AIDS is attributed in New York City. Sexual exposure accounts for 48 percent of cumulative AIDS cases, and injection drug use accounts for 43 percent.

The question has been raised as to whether the overall slowing in incidence after 1987 will prove to be stable, since AIDS case reporting is more delayed now than it was earlier in the epidemic. Lag time in reporting fluctuated but increased in the last 3 years examined. This is illustrated by the propor-

tion of reported cases diagnosed within 6 months prior to report: 91 percent in 1982, 90 percent in 1984, 88 percent in 1986, 76 percent in 1988, and 63 percent in 1990. Since active surveillance was initiated in 1981, the longest lag time observed was 112 months for a case diagnosed in 1982. Underreporting, a phenomenon of all surveillance systems, may also affect trends. Lengthening lag periods will increase measured underreporting of recent cases. Several studies under way at the New York City Department of Health to evaluate the completeness of reporting suggest that underreporting was greater by 1989, at 15–20 percent, than it was in the first 2 or 3 years of the epidemic, when underreporting was found to be less than 10 percent (33–36). A 20 percent inflation of numbers of cases reported in 1990, to correct for underreporting, is not sufficient to explain the overall slowing in incidence of AIDS cases and the leveling off of cases in men.

The examination of AIDS-related mortality over time provides validation of the AIDS incidence trends. Mortality trends may be expected to lag behind incidence by a factor which is related to the expected length of survival following diagnosis. Mortality, for which reporting lag time is not a factor, continued to rise through 1990, but not so rapidly as during the early years of the epidemic. This may reflect the slowing in incidence but also lengthening survival due to improved therapies available to increasing numbers of people. Mortality is influenced by out-migration, although only 5 percent of known deaths in New Yorkers with AIDS have occurred outside of New York City (New York City Department of Health, unpublished data). Mortality remains an invaluable measure of the toll of the epidemic, as AIDS remains first among causes of death in persons between 25 and 44 in New York City, and the third leading cause of death overall.

Studies of the spectrum of HIV disease in New York City have proven that surveillance misses instances of severe or fatal AIDS-related illness that do not meet the criteria for the case definition (36, 37). This

can occur when a full diagnostic workup is not completed (as among some indigent patients whose access to medical care is delayed), or when the manifestations of disease in a particular patient are not typical or specific to surveillance-definition AIDS. Among injection drug users, for example, increased deaths from pneumonia and sepsis during the past decade are likely to have been due to underlying HIV-related immunosuppression, but these cases would not be reportable as AIDS under the existing case definition (31, 35, 36).

In December 1992, CDC expanded the AIDS case definition yet again to capture missed morbidity (52). Because of the variety of illnesses represented in the spectrum of HIV disease, no AIDS surveillance definition will be able to capture all HIV-related morbidity. Surveillance of HIV infection itself has been proposed as an alternative to AIDS surveillance, and this is in place as an adjunct to AIDS surveillance in 34 states nationwide (38). HIV surveillance contains the strong bias of measuring only those who have sought HIV testing. AIDS surveillance is attractive, since it measures, albeit imperfectly, the visible, severe end of the HIV spectrum. This visibility permits better consistency in counting of cases between locations and over time. In addition, HIV-infected persons may remain well and in need of few medical services for many years. Many legislators and planners continue to use the number of reported AIDS cases or deaths as measures of the impact of HIV on their localities. For example, the federally legislated AIDS Care Act of 1990 uses a funding formula based on AIDS case counts (39).

The epidemic of HIV and AIDS is worldwide, with the epidemic in many countries being only a few years old (40–44). When various localities are examined according to the exposures which led to the epidemic, each locality has its own profile. For example, a mixture of injection drug use, heterosexual transmission, and sexual transmission between men is seen in New York City; predominantly sexual transmission between men is seen in San Francisco and Los An-

geles (45, 46); an apparent predominance of heterosexual transmission is reported in Central Africa; and there has been an unusual degree of nosocomial spread in some Eastern European countries (43, 44). The data on New York City are of interest because they describe one of the oldest and most closely watched epidemics of AIDS, an epidemic which incorporates patterns of transmission that overlap with those of many areas worldwide.

This report examines the past 10 years of the AIDS epidemic in New York City. These data have been used in attempts to predict the future of the epidemic (47, 48). Although the basic mechanisms of transmission have been established, the epidemic in New York City continues to change. This is due to the vagaries of human behavior, societal attitudes, prevention efforts, and medical therapies. An increase in the 1980s in risky behavior related to the high risk sex-for-drugs trade associated with crack cocaine could portend an upswing in AIDS cases in the future (49). On the other hand, several available population-based seroprevalence studies—in pregnant women, patients at sexually transmitted disease clinics, hospital patients, and women seeking abortion—show a level prevalence of HIV infection (32, 50, 51, and New York City Department of Health, unpublished data). Only through continued surveillance can subtle but important changes in the AIDS epidemic be reliably documented.

At present, there is no cure for HIV infection and no available vaccine. Whatever its shape, the epidemic will continue into the next century. The data on trends presented here may provide a model for the future of AIDS in the rest of the Western world.

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