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AIDS MORTALITY IN NORTH CAROLINA, 1988-92

by

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ABSTRACT

Acquired immunodeficiency syndrome (AIDS) has emerged as a leading cause of death for young adults in the United States. A detailed examination of AIDS mortality in North Carolina has not previously been published. In this report, sociodemographic patterns of AIDS mortality in North Carolina were investigated for the 5-year period 1988-1992.

Young adults aged 25-44 accounted for 78 percent of AIDS deaths in North Carolina during the study period. AIDS mortality rates were higher among men than women, and much higher among blacks compared to whites. AIDS mortality increased rapidly among adults aged 25-44 during the 5-year study period, becoming the leading cause of death among black men, the second leading cause of death among black women, and the fourth leading cause of death among white men by 1992. AIDS mortality was associated with a higher social class position (white collar employment and college education) among young black men and white men, but not among young black women. Geographically, the highest AIDS mortality rates were found in the eastern region of the state, while the greatest number of AIDS deaths were concentrated in North Carolina's largest cities.

AIDS has afflicted North Carolinians of all ages, races, and social class positions, although young black men have suffered the highest mortality from AIDS. AIDS deaths have occurred to residents of almost all of North Carolina's 100 counties. While state AIDS mortality rates are still below the national average, the findings of this study emphasize that AIDS is a growing public health problem in North Carolina.

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INTRODUCTION

Acquired immunodeficiency syndrome (AIDS) was first clinically recognized in the the early 1980's, and has since emerged as a leading cause of death for young adults in the United States. In 1990, AIDS was the leading cause of death among black men aged 25-44, and the second leading cause of death among white men and black women aged 25-44 in the United States (CDC, 1993a).

In the early years of the epidemic, AIDS mortality was concentrated in the major metropolitan areas of New York, California, and Florida. However, by 1990 AIDS was the leading cause of death among young men in 64 cities across the United States (Selik 1993). A detailed examination of AIDS mortality in North Carolina has not previously been published. In this report, sociodemographic patterns of AIDS mortality in North Carolina were investigated for the 5-year period 1988-1992.

METHODS

Descriptive analyses of age, race, and sex patterns of AIDS mortality included all North Carolina residents for the period 1988-1992. Subsequent detailed analyses of leading causes of death and social class patterns of AIDS mortality were restricted to black men, black women, and white men aged 25-44. White women, Hispanics, American Indians, and Asians were excluded from detailed analyses because of the small number of AIDS deaths in these groups. The age group 25-44 was chosen to provide comparability to national AIDS mortality statistics.

Death counts for AIDS were obtained from death certificate computer files maintained by the Vital Statistics Branch of the State Center for Health and Environmental Statistics. Deaths for which the underlying cause of death was coded 042-044, based on the International Classification of Disease (ICD-9), were classified as AIDS deaths for this study. Age, race, and sex-specific population counts for the years 1988-1992 were calculated using North Carolina census data, based on the linear trend in population growth from 1980 to 1990. AIDS mortality rates were computed for ages 25-44 by dividing race and sex-specific death counts by the comparable population counts for the 5-year period 1988 to 1992.

Leading causes of death for the age group 25-44 were determined by calculating the proportion of all deaths attributable to specific causes of death (e.g., AIDS, injuries, heart disease) and then ranking the causes. ICD codes for the specific causes of death investigated are listed in Appendix A. Mortality rates for each of the leading causes of death for ages 25-44 were calculated as described above for AIDS mortality rates.

The analysis of social class patterns of AIDS mortality used the years of education attained and usual occupation of the decedent as recorded on the death certificate. Five categories of educational attainment were analyzed: 8 years or less, 9 to 11 years, 12 years, 13-15 years, and 16 or more years. Specific occupations were grouped into seven broad categories: white collar, blue collar, service, farming, military, homemaker (recorded only for women), and not in the workforce/unknown. Typical service occupations include food service, janitorial, and child care workers.

For each of the three race-sex groups analyzed (white men, black men, and black women) the proportion of all deaths attributable to AIDS was used to calculate the expected number of AIDS deaths within each of the educational and occupational groups. The ratio of observed to expected deaths (proportionate mortality ratio, or PMR) for each group was then calculated. A PMR of 1.0 indicated that observed deaths equaled expected deaths for that social class group, while PMRs less than 1.0 indicated fewer than expected deaths from AIDS and PMRs higher than 1.0 indicated a greater number of deaths from AIDS than expected. For each PMR, 95 percent confidence intervals were also calculated. A PMR was considered statistically significant if its confidence interval did not include 1.0.

RESULTS

During the five year period 1988-1992, there were 2,223 decedents in North Carolina with AIDS listed as the underlying cause of death. The majority of these deaths were among males (84%) (Figure 1). While only 22 percent of North Carolina's population is black, 57 percent of AIDS deaths in North Carolina were among blacks (Figure 2).

Figure 1
Distribution of AIDS Deaths by Sex
North Carolina, 1988-1992

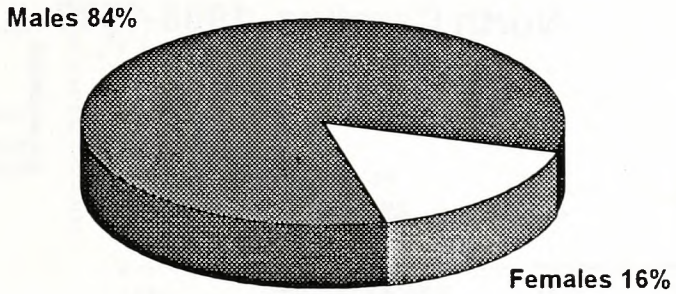
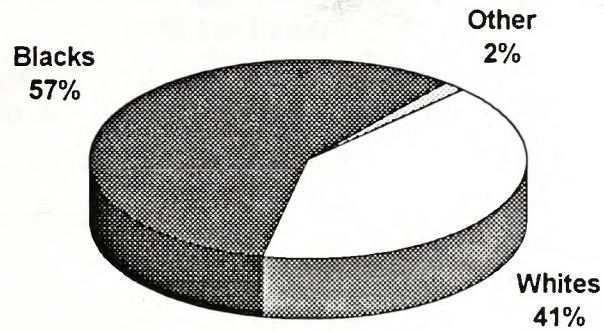


Figure 2
Distribution of AIDS Deaths by Race
North Carolina, 1988-1992



Unlike most chronic diseases, AIDS mortality is concentrated among young adults, as shown in Figure 3. The age group 25-44 accounts for 78 percent of all deaths from AIDS. Less than 2 percent of AIDS deaths occur among adults aged 65 years or older. Approximately 1.2 percent of AIDS deaths during 1988-1992 were to infants and children under the age of five.

AIDS mortality rates for young adults aged 25-44 are shown in Table 1. The average AIDS mortality rate (deaths per 100,000 population) for the period 1988-1992 was 0.6 for white women, 15.9 for white men, 18.4 for black women, and 75.1 for black men. Young black men in North Carolina were almost five times as likely to die from AIDS as young white men. Young black women were over 30 times as likely to die of AIDS as young white women in North Carolina during this time period.

Figure 3
Distribution of AIDS Deaths by Age
North Carolina, 1988-1992

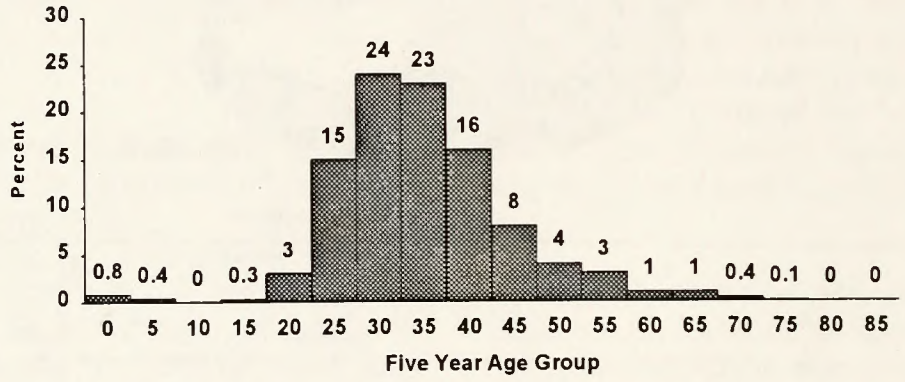


Table 1
AIDS Mortality Rates for Young Adults Aged 25-44, by Race and Sex, North Carolina 1988-1992

Race-Sex Group	Number of Deaths	Mortality Rate (Deaths per 100,000)
Black Men	806	75.1
White Men	650	15.9
Black Women	230	18.4
White Women	26	0.6

Among black men aged 25-44, the AIDS mortality rate increased from 40.9 per 100,000 in 1988 to 106.5 per 100,000 in 1992, an increase of 160 percent. Among white men aged 25-44, AIDS mortality increased 143 percent from 9.6 per 100,000 in 1988 to 23.3 per 100,000 in 1992. While AIDS mortality was higher among white men than among black women in 1988, black women experienced a greater relative increase in AIDS mortality of 326 percent from 1988 to 1992, so that by 1992 the AIDS mortality rate among black women was 32 percent higher than the rate among white men. The increasing trends in AIDS mortality for each race-sex group are shown in Figure 4.

Figure 4
AIDS Mortality by Race and Sex, Adults Aged 25-44, North Carolina, 1988-1992

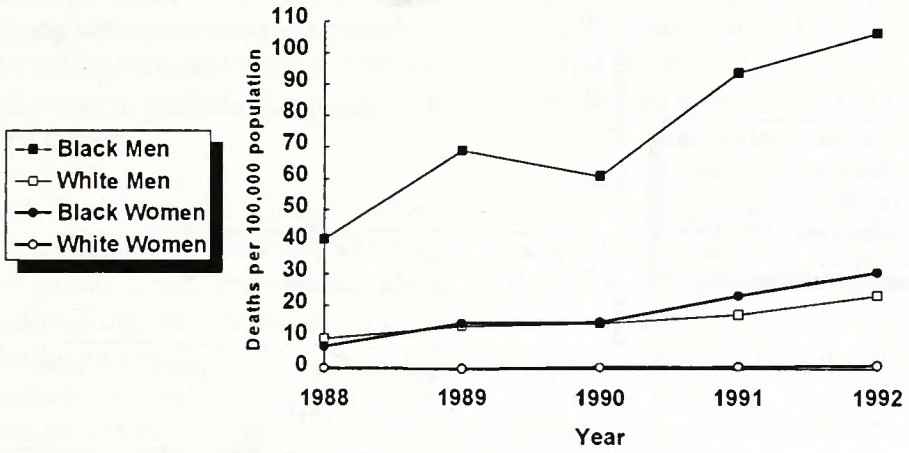
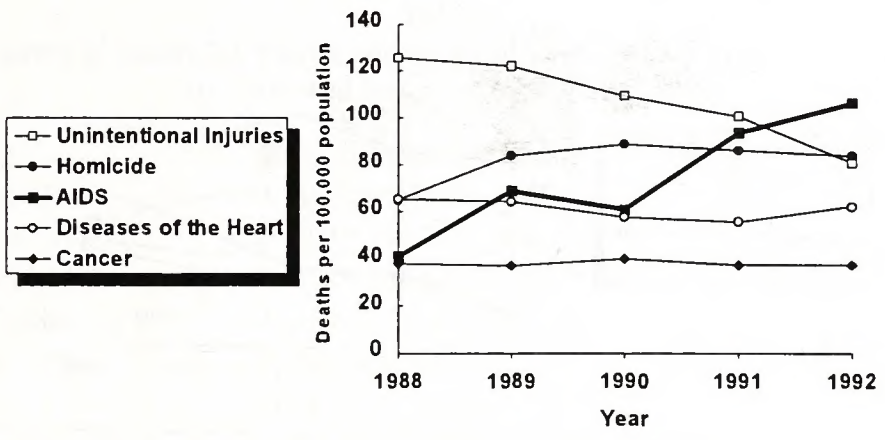


Figure 5
Leading Causes of Death, Black Men Aged 25-44, North Carolina, 1988-1992



Among young black men, a steep increase in AIDS mortality was accompanied by a significant decrease in mortality from unintentional injuries, with little change in mortality from homicide, heart disease, and cancer from 1988 to 1992 (Figure 5). These mortality trends resulted in AIDS rising from the fourth leading cause of death in 1988 to the leading cause of death in 1992 among young black men. Among white men there was little change in the ranking of leading causes of death over the five-year study period (Figure 6). AIDS mortality increased between 1988 and 1992 to become the fourth leading cause of death for young white men in 1992. Both AIDS and cancer mortality increased

Figure 6
Leading Causes of Death, White Men Aged 25-44, North Carolina, 1988-1992

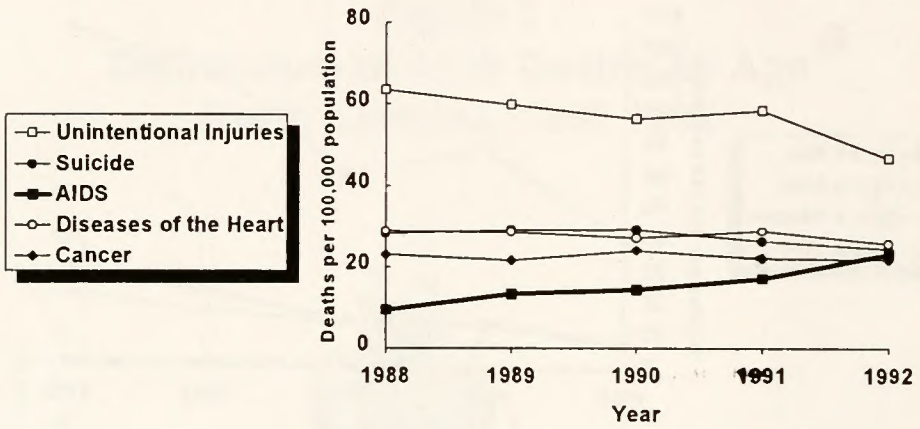
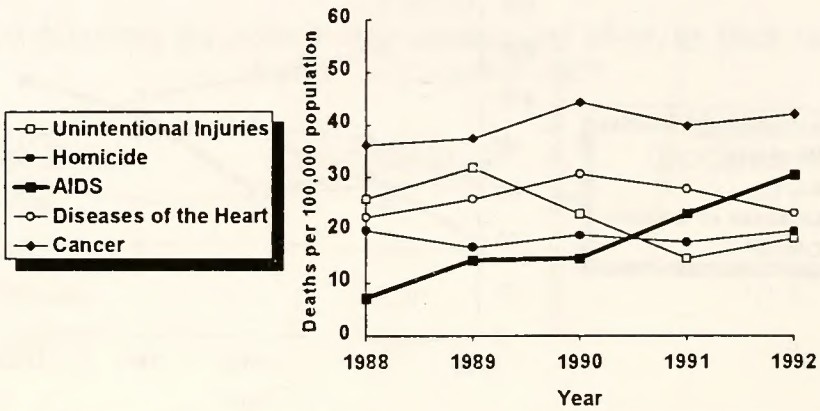


Figure 7
Leading Causes of Death, Black Women Aged 25-44, North Carolina, 1988-1992



among young black women from 1988 to 1992, while mortality from unintentional injuries decreased (Figure 7). AIDS climbed from the fifth leading cause of death among black women in 1988 to become the second leading cause of death, preceded only by cancer, in 1992. Trends in mortality rates for the leading causes of death are shown in Figures 5-7.

Among young black men, AIDS accounted for 20.3 percent of all deaths and was the leading cause of death in 1992. AIDS was listed as the underlying cause of death for 14.2 percent of all deaths among young black women, while 12.0 percent of all deaths among young white men were attributable to AIDS. The five leading causes of death in 1992 for black men, black women, and white men aged 25-44 are shown in Table 2.

Among both black men and white men aged 25-44, there were a disproportionately high number of AIDS deaths among those with some college education or a college degree. The observed number of AIDS deaths among young men with less than 9 years of education was only half the number expected for blacks (PMR 0.5, 95% confidence interval 0.3-0.7), and only one-ninth the number expected for whites (PMR 0.1, 95% confidence interval 0.1-0.2). In contrast, the educational pattern of AIDS mortality among young black women did not vary significantly from the pattern for other causes of death. Educational patterns of AIDS mortality are presented in Table 3.

Among young black men, there were over twice as many AIDS deaths as expected for white collar workers (PMR 2.2, 95% confidence interval 1.9-2.5), while there were 30 percent fewer AIDS deaths than expected among blue collar workers (PMR 0.7, 95% confidence interval 0.6-0.8). There were also 40 percent more AIDS deaths than expected among black male service workers (PMR 1.4, 95% confidence interval 1.2-1.6). Among young black male farm workers, only one-half as many AIDS deaths as expected were observed (PMR 0.5, 95% confidence interval 0.3-0.7). Occupational patterns of AIDS mortality are presented in Table 4.

Occupational patterns of AIDS mortality for young white men were similar to the patterns observed for young black men. Twice as many AIDS deaths as expected were observed among white collar workers (PMR 2.0, 95% confidence interval 1.8-2.2), while fewer than one-half as many AIDS deaths as expected were observed among blue collar workers (PMR 0.4, 95% confidence interval 0.3-0.5). The greatest excess of AIDS mortality among young white men was observed for service workers (PMR 2.6, 95% confidence interval 2.1-3.1). Only one-half as many AIDS deaths as

Table 2
Leading Causes of Death for Young Adults Aged 25-44 (with Percentage of All Deaths), by Race and Sex, North Carolina, 1992

Black Men	Black Women	White Men
1. AIDS (20.3%)	1. Cancer (19.7%)	1. Injuries (24.2%)
2. Homicide (16.0%)	2. AIDS (14.2%)	2. Heart Disease (13.4%)
3. Injuries (15.4%)	3. Heart Disease (10.9%)	3. Suicide (12.6%)
4. Heart Disease (11.9%)	4. Homicide (9.3%)	4. AIDS (12.0%)
5. Cancer (7.2%)	5. Injuries (8.6%)	5. Cancer (11.3%)

Table 3
Observed and Expected Number of AIDS Deaths by Years of Education for Young Adults Aged 25-44, by Race and Sex, North Carolina 1988-1992

	< 9 years	9-11 years	12 years	13-15 years	16+ years
Black Men					
Observed deaths	26	170	338	109	113
Expected deaths	56.7	210.7	349.5	75.5	43.5
PMR*	**0.5 (0.3-0.7)**	**0.8 (0.7-0.9)**	**1.0 (0.9-1.1)**	**1.4 (1.1-1.7)**	**2.6 (2.1-3.1)**
White Men					
Observed deaths	5	50	200	180	163
Expected deaths	43.5	115.3	237.0	95.0	82.2
PMR	**0.1 (0.1-0.2)**	**0.4 (0.3-0.5)**	**0.8 (0.7-0.9)**	**1.9 (1.6-2.2)**	**2.0 (1.7-2.3)**
Black Women					
Observed deaths	13	58	97	41	13
Expected deaths	12.5	48.5	99.8	31.8	18.0
PMR	**1.0 (0.4-1.6)**	**1.2 (0.9-1.5)**	**1.0 (0.8-1.2)**	**1.3 (0.9-1.7)**	**0.7 (0.3-1.1)**

*Proportionate mortality ratio (95% confidence interval).

Table 4
Observed and Expected Number of AIDS Deaths by Occupation Group for Young Adults Aged 25-44, by Race and Sex, North Carolina 1988-1992

	White collar	Blue collar	Service	Farming jobs	Military	Homemaker	Not in the Workforce/ Unknown
Black Men							
Observed deaths	211	337	150	33	21	---	54
Expected deaths	95.4	451.7	103.9	70.0	17.5	---	67.0
PMR*	**2.2 (1.9-2.5)**	**0.7 (0.6-0.8)**	**1.4 (1.2-1.6)**	**0.5 (0.3-0.7)**	**1.2 (0.7-1.7)**	---	**0.8 (0.6-1.0)**
White Men							
Observed deaths	368	130	99	13	7	---	34
Expected deaths	184.5	336.2	37.9	28.3	14.5	---	48.0
PMR	**2.0 (1.8-2.2)**	**0.4 (0.3-0.5)**	**2.6 (2.1-3.1)**	**0.5 (0.3-0.7)**	**0.5 (0.1-0.9)**	---	**0.7 (0.5-0.9)**
Black Women							
Observed deaths	52	39	65	5	---	49	18
Expected deaths	53.2	51.9	47.9	6.1	---	50.6	18
PMR	**1.0 (0.7-1.3)**	**0.8 (0.6-1.0)**	**1.4 (1.1-1.7)**	**0.8 (0.1-1.5)**	---	**1.0 (0.7-1.3)**	**1.0 (0.5-1.5)**

*Proportionate mortality ratio (95% confidence interval).

expected were observed among young white male farm workers (PMR 0.5, 95% confidence interval 0.3-0.7).

Among black women aged 25-44, the number of observed AIDS deaths equaled the number of expected AIDS deaths among white collar workers, homemakers, and those with unknown occupation. Observed AIDS deaths exceeded the number of expected AIDS deaths only among service workers (PMR 1.4, 95% confidence interval 1.1-1.7).

The greatest number of AIDS deaths among young adults during the five-year period 1988-1992 occurred to residents of Mecklenburg County, which contains the city of Charlotte and is North Carolina's largest metropolitan area (Figure 8). The metropolitan counties of Durham, Wake, and Guilford also experienced relatively high numbers of AIDS deaths. In over one-half of North Carolina's counties, adults aged 25-44 experienced fewer than 10 deaths from AIDS during this five-year period. However, in the majority of North Carolina's one hundred counties, the AIDS mortality rate per 100,000 population was 10 or higher for adults aged 25-44, as shown in Figure 9. AIDS mortality rates were higher in the eastern and piedmont regions of the state. In eleven counties, the AIDS mortality rate for young adults was 20 per 100,000 or higher. Young adults in the predominantly rural counties of Washington, Hertford, and Scotland experienced relatively high AIDS mortality rates, although the absolute number of deaths was low.

DISCUSSION

During the period 1988-1992, AIDS emerged as a leading cause of death among young adults in North Carolina. Blacks suffered much higher AIDS mortality rates than whites, and AIDS mortality increased more rapidly among North Carolina's black population. County AIDS mortality rates for young adults were highest in eastern North Carolina, where blacks are a greater proportion of the population than in western North Carolina. The greatest number of AIDS deaths occurred in the metropolitan counties of Mecklenburg (Charlotte), Wake (Raleigh), Durham (Durham) and Guilford (Greensboro).

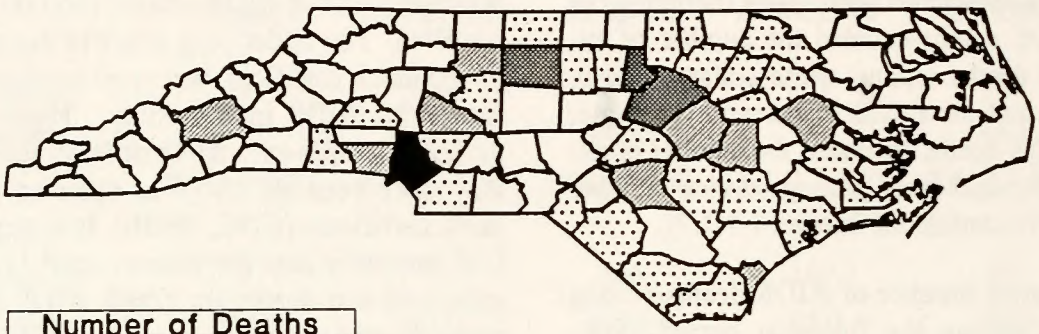
These results almost certainly underestimate the true extent of AIDS-related mortality in North Carolina. The underlying cause of death recorded on the death certificate was used to classify deaths caused by AIDS in this study. However, some deaths of people with AIDS or HIV-positive status may have been attributed to other causes on the death certificate (CDC, 1993b). In a study of 1988 U.S. mortality data for women aged 15-44, it was estimated that deaths for which AIDS was designated the underlying cause on the death certificate represented only 55 to 80 percent of all AIDS-related deaths (Buehler et al., 1992). In a later study of over 19,000 persons of all ages for whom AIDS case reports had been filed with the Centers for Disease Control, and who had subsequently died during 1987 to 1989, 81.1 percent of death certificates listed AIDS as the underlying cause of death (Chu et al., 1993).

While AIDS mortality rates in North Carolina increased dramatically from 1988 to 1992 for young black men, white men, and black women, U.S. AIDS mortality rates still exceeded North Carolina rates in 1992. The total U.S. AIDS mortality rate for young white men aged 25-44 was 79 percent higher than the North Carolina rate in 1992. However, North Carolina blacks suffered AIDS mortality rates closer to the national average. The U.S. AIDS mortality rate for black men aged 25-44 exceeded the North Carolina rate by only 28 percent, while for young black women the U.S. AIDS mortality rate was only 24 percent higher than the North Carolina rate in 1992.

Public health research on AIDS has primarily focused on what have been defined as high-risk behaviors by the Centers for Disease Control: homosexuality or bisexuality among men; injection drug use; and heterosexual relations with bisexual men, injection drug users, or any HIV-infected individual (CDC, 1992). Health education programs and community interventions have been designed under the assumption that these risk

Figure 8

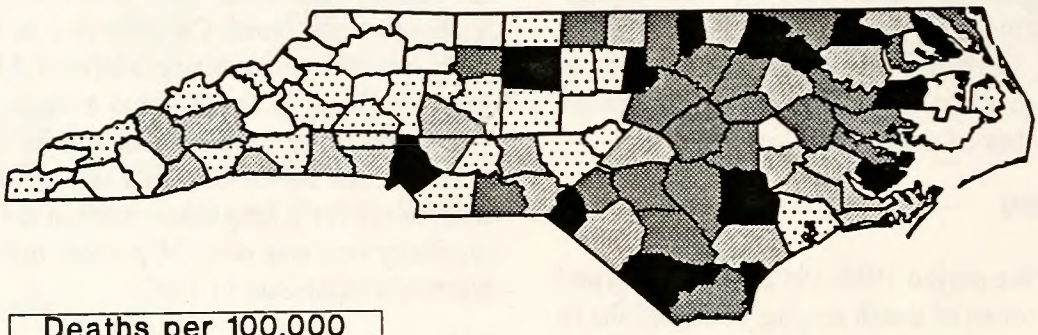
Number of AIDS Deaths, Ages 25-44
North Carolina, 1988-1992



Number of Deaths
- 0-10
- 11-19
- 20-85
- 101-159
- 287

Figure 9

AIDS Mortality Rates, Ages 25-44
North Carolina, 1988-1992



Deaths per 100,000
- 0-4
- 5-9
- 10-14
- 15-19
- >20

behaviors define population groups that are socially and culturally distinct from the "general population" (Singer, 1994). However, individuals who share a common risk behavior, such as injection drug use, may represent diverse racial, ethnic, cultural, and social class backgrounds, as a recent ethnographic study in New Jersey demonstrated (Glick Schiller et al., 1994). Media stereotypes portray men who engage in homosexual behavior as white, middle class, and living a "gay lifestyle," and injection drug users as racial/ethnic minorities who engage in criminal activity to support their drug habits and are often homeless. In reality, there are injection drug users who are white, steadily employed and in stable housing situations, and there are many men of all races, ethnicities, and social class backgrounds who engage in homosexual behavior and may not identify themselves as "gay" or homosexual.

In contrast to health behaviors, social class categorizations more accurately reflect the social, economic, and cultural affiliations which define population groups. Social class, usually defined by social scientists on the basis of wealth, income, occupation, and education, often determines (along with race/ethnicity) where a person lives and works, and with whom a person will develop friendships and intimate sexual relationships. For AIDS prevention efforts, social class groups may represent a more appropriate target for culturally-specific health education programs and community interventions than groups defined solely by high-risk behaviors.

Unfortunately, social class patterns of AIDS morbidity and mortality have not been widely reported. Lack of recognition of the importance of social class in determining health outcomes has resulted in the exclusion of social class data from national health data systems (Krieger and Fee, 1994), including the AIDS morbidity surveillance system. Social class patterns of AIDS morbidity are therefore only available from expensive epidemiological studies, which are rarely geographically and temporally comprehensive.

In this study, social class patterns of AIDS mortality among young adults in North Carolina were investigated using the education and usual lifetime occupation of the decedent as recorded on the death certificate. AIDS mortality was associated with a more privileged social class position (i.e. college education, white collar occupation) among young white men and black men, but not among young black women. These findings suggest that the social class patterns of AIDS mortality in North Carolina are complex, varying by both race and gender, and may differ from "typical" patterns of AIDS mortality found in New York City and other large metropolitan areas, where many previous research studies of AIDS have been conducted.

Weaknesses in the data available to investigate social class patterns of AIDS mortality highlight the need for further study before firm conclusions can be drawn. Education and occupation alone are not the best measures of social class position (Kreiger and Fee, 1994), however, these data items are all that are currently available in routine health surveillance systems. The proportionate mortality ratio measure used in this study provides a good approximation of relative risk estimates, which would ideally be calculated by comparing population-based mortality rates (Rosenberg, 1993). However, the possibility of statistical bias in the PMR estimates leading to the findings observed in this study can not be completely eliminated. For example, an elevated PMR for AIDS in one social class group could reflect unusually low mortality from other causes of death instead of higher than average AIDS mortality.

In conclusion, AIDS has afflicted North Carolinians of all ages, races, and social class positions, although young black men have suffered the highest mortality from AIDS. AIDS deaths have occurred in almost all of North Carolina's 100 counties. While state AIDS mortality rates are still below the national average, the findings of this study emphasize that AIDS is a growing public health problem in North Carolina.

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APPENDIX A
ICD-9 Codes for Selected Causes of Death
(Listed in Alphabetical Order)

Cause of Death	ICD-9 Codes
AIDS	042-044
Cancer	140-208
Injuries (unintentional)	E800-E949
Heart Disease	390-398, 402, 404-429
Homicide	E960-E978
Suicide	E950-E959

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