LIFE TABLE ANALYSIS OF AIDS MORTALITY

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Introduction

Since AIDS was described in 1981, it has had a dramatic effect on the life and health insurance industry. In the past few years there have been studies with enough experience to allow us to look at the 5-year survival of those diagnosed with AIDS. The purpose of this article is to analyze two such studies with different populations, one based in New York City and the other in San Francisco.

Subjects Studied and Methods

The first study was a retrospective analysis of 5,833 AIDS cases (based on the pre-1987 CDC clinical case definition) reported to the city of New York prior to December 31, 1985. The analysis of survival was done by a cross-linkage of death records. The authors acknowledge that this method "may have resulted in some underascertainment of deaths due to outmigration." If a subject moved his or her permanent address out of New York City prior to death, they could be incorrectly included as a survivor.1

Cumulative survival was generated utilizing Statistical Analysis System (SAS) software, and reported for each yearly interval through five years. Five variables were evaluated, including race or ethnic background, sex, age, probable route of infection, and manifestation of AIDS at diagnosis.1

The second study was a survival analysis of 4,323 AIDS cases diagnosed in San Francisco between July 1981 and December 31, 1987. Cases were being followed prospectively throughout the study period by a variety of mechanisms such as active surveillance and other reports from other health departments or registries. Vital status and treatment follow-up were done by reviewing medical records and contacting physicians. The surveillance also included daily review of death certificates and obituaries.2

The San Francisco study also examined survival by year of diagnosis to look for effects of recent changes in therapy. In addition other variables (race or ethnic background, sex, age, probable route of infection, and manifestation of AIDS at diagnosis) were examined to determine their effect on survival. Survival was also analyzed in a group of 172 who received zidovudine at some time during their illness in comparison to a group of 461 who did not have zidovudine therapy.2

In the San Francisco, study median survival and cumulative probability of survival were calculated using the Kaplan-Meier product-limit method as performed on the BMDP statistical software package.2

Results and Discussion

The populations of the study groups were quite diverse. The New York City cases were 47.2% white and 90.5% men. By contrast, the San Francisco group was 84.3% white and 99.3% men. The population was slightly older in the San Francisco group, with 36.4% age 40 or older, compared to 33.3% in the New York group. Members of the cohort who had intravenous drug use as a risk factor represented 34.2% of the New York group and 13.3% of the San Francisco study population.

In the New York City study, 11.4% were diagnosed with AIDS at or near the time of death. These deaths were included in the analysis of first-year mortality.

Both studies found that males in general survived longer than did females after the diagnosis of AIDS. They both also found that survival was longest for those diagnosed with AIDS in their 30s, with shorter survival at younger and older ages at diagnosis. In the New York City study, the median conditional probability of survival from the date of diagnosis was 347 days. In the San Francisco cohort, the estimated median survival was 380 days.

Both studies demonstrated a trend toward increasing survival time in the more recently diagnosed cases. The San Francisco study included only the cases that met the pre-1987 CDC case definition of AIDS so that there would not be a confounding effect of differing criteria for diagnosis. It was also noted that those presenting with Kaposi's Sarcoma did better than those presenting with Pneumocystis carinii pneumonia. Those with multiple conditions and those with early relapses did very poorly.2

Survival of those in the San Francisco study who were treated with zidovudine was "significantly longer" than survival in those without such treatment.2 At the time of the study, the authors estimated an expected median survival of 21.3 months after AIDS is diagnosed for those treated with zidovudine versus 13.9 months for those not treated.2

Tables 1 and 2 contain the comparison of the observed survival of the two groups to expected survival from the 1986 U.S. Life tables. The longest survival for a person with AIDS was 8.9 years in the New York City group and 8.1 years in the San Francisco group.

Summary

Through 1990, over 100,000 deaths of patients with AIDS have been reported to the CDC. An estimated one million persons in the U.S. are infected with HIV and an estimated 165,000-215,000 will die of AIDS during 1991-93. Insurers paid one billion dollars in AIDS-related claims for life and health insurance in 1989 and 1.2 billion dollars in 1990.34 It has been projected that the median incubation period in homosexual and bisexual men in San Francisco is 11 years.5 The studies analyzed in this article would
indicate that cumulative survival after the diagnosis of AIDS is very low, although improving slightly with recent changes in diagnosis and therapy.

Many thanks to Dr. Richard Singer and Dr. Michael Kita for their valuable instruction at the Advanced Mortality Methodology Seminar. This article is a result of their encouragement and example.

REFERENCES


Table 1
Comparative Mortality by Duration, 5,833 AIDS Patients in New York City Reported Prior to 1986

<table>
<thead>
<tr>
<th>Duration Interval</th>
<th>Observed Cumulative</th>
<th>Survival Interval</th>
<th>Mortality Observed</th>
<th>Rate Expected*</th>
<th>Interval Mortality Ratio</th>
<th>Excess Death Rate</th>
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<tr>
<td>(years)</td>
<td>P</td>
<td>P</td>
<td>q</td>
<td>q'</td>
<td>100 q'/q'</td>
<td>1000 (q-q')</td>
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<td>.0044</td>
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* The expected mortality rates were calculated using 1986 U.S. Life Tables with adjustment for the sex, age and race of the initial study population.
† The Geometric Average Annualized Mortality Ratio for the interval 0-5 years was 7,200%. The Geometric Average Annualized Excess Death Rate for the interval 0-5 years was 310.

Table 2
Comparative Mortality by Duration, 4,323 AIDS Patients in San Francisco Reported July 1981 through 1987

<table>
<thead>
<tr>
<th>Duration Interval</th>
<th>Observed Cumulative</th>
<th>Survival Interval</th>
<th>Mortality Observed</th>
<th>Rate Expected*</th>
<th>Interval Mortality Ratio</th>
<th>Excess Death Rate</th>
</tr>
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<tbody>
<tr>
<td>(years)</td>
<td>P</td>
<td>P</td>
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<td>q'</td>
<td>100 q'/q'</td>
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<td>486</td>
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* The expected mortality rates were calculated using 1986 U.S. Life Tables with adjustment for the sex, age and race of the initial study population.
† The Geometric Average Annualized Mortality Ratio for the interval 0-5 years was 10,700%. The Geometric Average Annualized Excess Death Rate for the interval 0-5 years was 486.