

## CONSTRUCTION OF THE AIDS DATABASE

The KPNCR AIDS database was constructed from three computerized sources (described below) and contained a total of 940 patients diagnosed with AIDS between January 1981 and June 30, 1987.<sup>2</sup>

1) The Inpatient Utilization System (IUS) file contains data for all hospitalizations at any KPNCR hospital and includes up to 13 ICD-9-CM diagnostic codes per admission. These data have been used in many epidemiologic studies and their accuracy verified for a variety of diagnoses.

The file was searched from 1981 onward for definite and probable cases of AIDS, applying an AIDS case definition based on that of the Centers for Disease Control (CDC) criteria (10, 11).

2) The pathology file contains biopsy reports from five major KPNCR hospital pathology departments, including San Francisco's and Oakland's. Probable cases of AIDS were identified from biopsy diagnoses of Kaposi's sarcoma (KS), *Pneumocystis carinii* pneumonia (PCP), candidiasis, and certain non-Hodgkin's lymphomas.

3) The KPNCR hospital pharmacy file contains information on all patients on AZT treatment protocols.

Medical records of most cases identified only by the pathology file or the AZT list were reviewed to verify the diagnosis of AIDS and to identify the date of diagnosis. Medical records of many women who lacked a specific diagnosis of AIDS were also reviewed. At chart review, cases not fitting

CDC criteria for AIDS were removed from the database.

In September 1987, the CDC expanded its criteria for the diagnosis of AIDS to include AIDS-dementia and generalized wasting. Due to time constraints, these criteria could not be applied in identifying cases in the database. Therefore, the numbers presented in this report may underestimate the total number of AIDS cases by about 5 percent (13). On the other hand, the AIDS database used in this report represents a combination of cases identified solely by computer criteria and cases confirmed either by chart review, the Confidential Case Report filed with the State, or a report from an Infection Control nurse. A few cases currently in the file therefore may not represent AIDS.

Table 3-1 shows the frequency of the best currently available source of diagnosis for the 940 cases in the AIDS database in decreasing order of certainty of the diagnosis.

On the basis of their initial AIDS-related diagnosis, an attempt was made to classify all cases as either AIDS with infection (042.0),

Table 3-1--- AIDS Cases by Best Source of Confirmation

Source	Number	Percent
Chart review .....	87	9.3%
Copy of confidential case report . . .	110	11.7
Infection control nurse's report...	93	9.9
IUS (hospitalization) file and AZT file .....	88	9.4
IUS file and pathology file.....	96	10.2
IUS file only .....	426	45.3
Pathology file only .....	35	3.7
AZT file only .....	5	0.5
Total .....	940	100%

<sup>2</sup> The prevalence of HIV seropositivity and of AIDS-related complex (ARC) among the KPNCR membership are unknown.

SOURCE: Kaiser Permanente (Northern California Region), unpubl. data, Oakland, CA, 1988.

AIDS with neoplasm (042.2), or AIDS with other diagnosis (042.9). In the absence of a diagnosis of AIDS on the hospital discharge form, a presumptive diagnosis of AIDS was made in males less than 60 years of age if an AIDS-related diagnosis was noted without an alternative diagnosis to explain immune deficiency. (The medical records of all men less than 60 years of age who have a diagnosis suggestive of AIDS but not a diagnosis of AIDS itself, are to be reviewed further. Women and men over 60 years of age with 2 possible AIDS-related diagnoses were not included, but their charts are also to be reviewed to identify possible additional cases. ) The decision rules, based to the extent possible on the CDC case definition, that were used to guide classification are summarized in table 3-2.

For each AIDS case, whether chart review was performed or not, the date of diagnosis was defined as the earliest date associated with a diagnosis of AIDS or a diagnosis compatible with AIDS. This date was used in the descriptive analysis of all cases and as the starting point for the calculation of AIDS-related costs in the sample.

---

## DATA COLLECTION METHODS FOR MEASURING RESOURCE UTILIZATION

AIDS patients had voluminous medical records and although a larger sample would be desirable, time did not allow for complete data collection for more than a sample of 30 patients. For each of the 30 cases in the sample, complete inpatient, outpatient, hospice, and home health care records, beginning 1 year prior to the date of diagnosis, were reviewed by trained medical records analysts. Each service or resource was entered as a separate item and assigned a cost.

As noted, sample size was limited primarily by the time available to review medical records with the appropriate scrutiny. The sample was also restricted to patients

diagnosed since January 1, 1984, in order to reflect more recent utilization patterns while also allowing enough time for the disease to run its course.

Table 3-3 provides details on the data that were collected to help measure the resource utilization of the 30 sample AIDS patients.

---

## UNIT COST CALCULATION

Average unit costs were assigned to all the identified services provided to AIDS patients. These unit costs are “fully loaded” to include the expenses attributable directly to the delivery of a service, the “overhead” connected with the operation of the medical facility, and the indirect “overhead” connected with health plan operations. No effort was made to separate the AIDS-related costs of care from the costs of other services provided to AIDS patients. Assuming average utilization of non-AIDS-related services among the 30 sample cases, the effect on the cost estimates would be negligible. (See appendix A, table A-5, for average utilization statistics for all KPNCR members.)

Average unit cost calculation was based on the standard methodology used for KPNCR’S Medicare cost reports. Cost data were drawn primarily from 1986 sources.

---

## Hospital Bed Unit, Per Diem

The nursing costs of AIDS patients who are hospitalized in units with non-AIDS patients cannot be readily determined. However, in an AIDS-dedicated nursing unit, such as in the San Francisco facility, nursing costs are about 40 percent greater than the costs for other medical/surgical patients. This additional cost was included in the per diem hospital bed cost. Overhead was allocated to direct costs (such as nursing and supplies), based on the standard stepdown methodology used for Medicare cost report-

Table 3-2. --AIDS Classification Guidelines

Case identified by	Classification
1. Copy of Confidential Case Report sent to the State	Included as a case; no chart review; initial diagnosis obtained from the case report
2. Infection control nursing records (without copy of confidential case report or information on initial diagnosis)	Included as case; no chart review; classified as 042.9 (AIDS, initial diagnosis unspecified)
3. Diagnosis on the IUS file:	
a. ICD-9-CM diagnosis of AIDS (279.10 - 279.19 before Sept. 1986, 042.0 - 042.9 thereafter):	
o With additional diagnosis of AIDS-related opportunistic infection	Classified as 042.0, no chart review
o With additional diagnosis of AIDS-related neoplasm	Classified as 042.2, no chart review
o With additional diagnosis of wasting or dementia	Classified as 042.9, no chart review
o With no additional AIDS-related diagnoses	Classified as 042.9, no chart review
b. No ICD-9-CM diagnosis of AIDS, but male, <60 years old, and no other diagnosis to explain immune deficiency:	
o With AIDS-related opportunistic infection, including:	Classified as 042.0, chart review pending
--Pneumocystis carinii pneumonia,	
--toxoplasmosis of central nervous system	
--cryptococcal meningitis	
--coccidiosis	
--CMV pneumonia, excluding neonatal	
--progressive multi focal leuko-	
--encephalopathy	
--candidiasis of esophagus	
o With AIDS-related neoplasm:	Classified as 042.2, chart review pending
--Kaposi's sarcoma (ICD-9-CM 173.8)	
c. No ICD-9-CM diagnosis of AIDS, female or male >60 years	Excluded from database, chart review pending
4. AZT file or Pathology File only	Chart review done to verify diagnosis. If chart review revealed that AIDS was not diagnosed, the case was removed from the database

SOURCE: Kaiser Permanence (Northern California Region), unpublished material, Oakland, CA, 1988.

Table 3-3.--Data on Resource Utilization of AIDS Patients

Resource	Data collected
1. Inpatient services	<ul style="list-style-type: none"> <li>a. Date and hour of entry, discharge, and transfer of service.</li> <li>b. Inpatient service (e.g., intensive care, medical/surgical, hospice).</li> <li>c. Specialty consultation.</li> </ul>
2. Inpatient pharmacy services	<ul style="list-style-type: none"> <li>a. Utilization was estimated based on prescriptions ordered for all hospitalized AIDS patients during an 8-day period of observation in the San Francisco and Oakland facilities in October 1987.</li> </ul>
3. Outpatient services (excluding psychiatric utilization)	<ul style="list-style-type: none"> <li>a. Date of visit (or service).</li> <li>b. Facility type.</li> <li>c. Clinic type.</li> <li>d. Provider type.</li> <li>e. Procedures: diagnostic or therapeutic (e.g., lumbal puncture, Laboratory, radiology).</li> <li>f. Support services (e.g., social services).</li> <li>g. Prescriptions: quantity, strength, refills.</li> </ul>
4. Psychiatric services	<p>For reasons of patient confidentiality, use of psychiatry services was assessed by the staff of the psychiatry departments in Oakland and San Francisco. A list of all patients in the sample was submitted to each department. Department staff examined charts to record the following:</p> <ul style="list-style-type: none"> <li>a. Date of visit.</li> <li>b. Visit type.</li> <li>c. Provider type.</li> <li>d. Prescriptions.</li> </ul>
5. Outpatient pharmacy services	<p>It has been assumed that all prescriptions and refills indicated in the record were actually dispensed and that refills were not prescribed unless indicated. This approach is inaccurate to the extent that clinicians fail to record refills authorized or patients fail to fill all prescriptions or refills indicated. In some instances, notation of prescriptions was incomplete. For example, the quantity prescribed was often omitted. In such cases, a standard quantity was assumed (e.g., a 10-day supply of antibiotic, or a 1-month supply of other medications).</p>

SOURCE: Kaiser Permanence (Northern California Region), unpublished material, Oakland, CA, 1987.

ing.<sup>3</sup> Pharmacy costs, generally a part of the allocation process, are specifically excluded and treated as a separate cost area.

---

## Physician Visits: Clinic and Hospital

The cost of a physician's office visit was derived from The Permanence Medical Group's 1986 Unit Cost Worksheet. Overhead costs, including plant operation and local administration, were included. The emergency room is considered an outpatient clinic and assigned a visit cost along with other outpatient clinics. Inpatient physician services (such as bed rounds) were treated separately from physician clinic activity. There was no overlap between the overhead costs allocated to physician clinic v. physician hospital services.

Average visit costs were calculated by dividing total clinic costs (including non-physician provider costs) by total physician visits. No distinction was made between the cost of AIDS visits and other visits. It was not possible to determine whether, on average, visits by AIDS patients consume more (or less) resources than visits by others.

---

## Medications: Inpatient and Outpatient

The Pharmacy Chiefs at the San Francisco and Oakland hospitals agreed that, based on their informal observations, the drugs used to treat AIDS inpatients are more expensive, on average, than those used to treat non-

AIDS inpatients who are hospitalized within the same bed unit. Since the individual inpatient pharmacy costs incurred by the sample of 30 patients were not available, a mean per diem drug cost from pharmacy medication logs for all AIDS patients hospitalized in San Francisco and Oakland in a week in October 1987 was used.

The Pharmacy Chiefs also noted that there is not a significant difference between the cost of dispensing drugs to AIDS inpatients v. other patients in the same unit. Consequently, average hospital dispensing costs (inclusive of overhead) were added to the cost of the AIDS medications.

Outpatient prescriptions were individually tallied and costed out using the current cost of the drug in the pharmacy's inventory asset file. The costs were then adjusted to reflect direct and indirect dispensing expenses.

---

## Ancillary Services: Weighted Procedures

Average unit costs were derived for the ancillary services typically used by AIDS patients. For many services, including EEG, EKG, hospital laboratory, pathology laboratory, physical therapy, radiology, and respiratory therapy, a weighted value methodology was used to estimate unit costs. All applicable direct and indirect overhead were taken into account.

It is widely acknowledged that weighted value costing of ancillary services has weaknesses. The major criticism is that the cost weights employed are only approximations of the actual relative amount of resources required to provide the various tests and therapies. In addition, important cost differences within a cost center (e. g., hematology v. chemistry laboratory tests) may be masked. This could be significant if the mix of tests provided to AIDS patients significantly differs from that given others.

---

3 The stepdown method allocates the following overhead costs to inpatient beds: 1) buildings and fixtures, 2) moveable equipment, 3) employee benefits, 4) administrative and general, 5) maintenance and repairs, 6) operation of plant, 7) linen and laundry, 8) housekeeping, 9) dietary, 10) cafeteria, 11) nursing administration, 12) central supply, 13) medical records, 14) social service, 15) health plan administration, and 16) residents' salaries and benefits.

## Surgery

The cost of surgery was divided into two components: 1) professional fees attributable to the surgeon and anesthesiologist and 2) hospital operating room costs (including the recovery room and nurse anesthetists). The total average hourly cost of the professional component was drawn from the Medicare Part B Revenue Worksheet. The total average hourly cost of the operating room was derived using standard stepdown methodology. Overhead was allocated to both cost components.

## Other Services

Other services covered by the health plan and used by AIDS patients were assigned unit costs. The average cost of a home health visit was derived by dividing the total fully allocated cost of the department of home health by the total number of visits. The costs of blood and blood products purchased from county blood banks were defined as the rates charged by those agencies. Ambulance services and outside claims and referrals for specialized services unavailable within the health plan were treated similarly.

## SURVIVAL METHODOLOGY

“Survival” methods, also known as “lifetable” methods, were used to examine the distribution of such lifetime amounts and costs of medical service utilization. Survival methods were specifically developed to estimate the amount of time that individuals survive from a starting point to an endpoint, given data on some individuals who are observed until the endpoint and some who are not. Typically, the starting point is the time of disease diagnosis and the endpoint is the time of death. In this analysis, interest centers on the cost from diagnosis to death, rather than on the survival time from diagnosis to

death.<sup>4</sup> The cost for care from time of diagnosis to the end of observation is a non-negative lower bound for the lifetime cost, which cannot be known until death.

The primary advantage of survival methods for the examination of lifetime cost is that they can make use of information about patients who are still alive. The authors are unaware of any other studies that have used survival methods to estimate the cost of care for AIDS or other illnesses. Survival methods provide unbiased estimates of the lifetime costs that eventually would be attained by living AIDS cases if their future chances of death at various cost levels continue to fit the best model of the recent past. This approach is especially appropriate for the examination of lifetime health care costs in a rapidly growing epidemic if the cases who have died tend to have been short-lived and less costly, or if the patients who are still alive tend to be in early and less costly stages of the disease. The estimators of mean and median lifetime amounts and costs of medical services utilized were obtained by a basic method of survival analysis known as the product-limit method (8). (A formal presentation of the product-limit method is presented in appendix B.)

Subgroup specific estimates of lifetime costs are assessed with the logrank test (12).

In addition to estimates of lifetime cost, estimates of mean costs per patient per year were calculated. These estimates are simple cost rates derived by: 1) summing the total costs of all patients for a given year, 2) summing the amounts of time that the patients were observed for that year, and 3) dividing the former sum by the latter sum. Thus, every patient contributes to the estimate for a given year if he is observed at all during the year, and his contribution to the overall estimate is weighted by the proportion of the year for which he is served.

<sup>4</sup> For convenience, we use the term “cost” to present the method for analyzing both cost and amount of services utilized.