

# Seroprevalence Of Human Immunodeficiency Virus Among Family Practice Outpatients

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**Background:** Because the human immunodeficiency virus (HIV) is extremely heterogeneous in its impact on various subpopulations, it is important to carry out HIV seroprevalence studies in different subpopulations using standardized techniques. The present study is the first to report seroprevalence rates of HIV in family medicine outpatient populations.

**Methods:** To estimate the prevalence and demographic distribution of HIV, 3874 sera samples were collected anonymously at six family medicine clinics in San Bernardino County during a 1-year period.

**Results:** Fifty-nine (1.52 percent) of the sera samples were confirmed HIV-positive. Of the 59 HIV-positive patients, 43 were visiting the clinic for HIV-related reasons. Excluding these 43 cases, and adjusting for age and race using the county population as a standard, the overall rate of HIV infection was 0.45 percent. The 16 HIV-positive patients who visited the clinics for reasons unrelated to HIV were between the ages of 20 and 59 years, with the 30- to 39-year-old age group having the highest prevalence (1.4 percent). Seroprevalence was eight times higher for men than women ( $\chi^2 = 14.3$ ,  $P = 0.0002$ ), and rates for African-Americans (0.85 percent) were two to three times higher than for Hispanics (0.40 percent) and whites (0.25 percent).

**Conclusions:** Results of this study are consistent with and support findings from previous surveys of more general populations in the western United States. There are approximately 7800 HIV-infected persons residing in San Bernardino County, and an estimated \$796 million will be required to treat these individuals. (J Am Board Fam Pract 1993; 6:347-52.)

Although California has slightly more than 10 percent of the nation's population,<sup>1</sup> the state has accounted for more than 20 percent of the nation's deaths related to acquired immunodeficiency syndrome (AIDS).<sup>2</sup> During 1991 a total of 7823 new AIDS cases were reported in California, and 354 of these cases were reported in San Bernardino and Riverside Counties. It has been predicted that San Bernardino County will have the largest percentage of increase in new AIDS cases diagnosed per year through 1993.<sup>2</sup> Although the impact such an increase would have on family practice physicians is unknown, there is evidence of an increasing likelihood that California family physicians will encounter at least 1 AIDS patient

in the family medicine setting, especially in more rural areas.<sup>3</sup>

To estimate the prevalence and demographic distribution of human immunodeficiency virus (HIV) infection among family medicine patients in San Bernardino County, we conducted an anonymous HIV seroprevalence study of patients coming to family medicine clinics. This study is one of several research projects conducted by the Center for Studies in Family Medicine (CSFM), a pilot program designed to stimulate research networking among practicing family physicians and the academic family medicine community in California. The CSFM is sponsored by the Family Health Foundation of America, the California Academy of Family Physicians, and the California Institute of Family Medicine. In 1987 the CSFM chose a core group of researchers from a survey of 732 California family medicine physicians who were interested in conducting collaborative family medicine research. Physicians participating in the present study were recruited from this core group of researchers. The study protocol was approved by the Institutional Re-

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view Board at the San Bernardino County Medical Center (SBCMC).

### Methods

SBCMC is located in the city of San Bernardino, which is about 50 miles east of Los Angeles. The population of San Bernardino County is 1,418,380, of whom 164,164 reside in the city of San Bernardino.

At SBCMC the outpatient family medicine clinics are staffed by a combination of family medicine residents, faculty physicians, nurse practitioners, and support personnel. The three SBCMC clinics that participated in this study are located in Colton, Fontana, and San Bernardino.

Three private family practice clinics also participated in this study: two in the city of San Bernardino and one in Highland, a city east of San Bernardino. Private practices were selected based on physicians' responses to a research interest questionnaire sent out by the CSFM in 1989. Local family physicians who expressed a willingness to participate in research projects were asked to participate.

At the private family practice clinics, 75 percent of patients had some form of prepaid insurance, 20 percent had private fee-for-service insurance, and the remaining 5 percent paid cash or had no insurance. Medicaid and Medicare accounted for negligible numbers of patients; instead, the majority of patients who were eligible for Medicare had a supplemental insurance plan. These numbers contrast markedly with the SBCMC clinics in which 65 percent of patients had public health care assistance (e.g., Medicaid, Medicare, Medically Indigent Adult, or Child Health and Development Program), 23 percent were self-paying, and only 12 percent had some form of private insurance.

Sera were collected anonymously during the course of routine blood sample collection at all participating clinics. Collection tubes and data forms were numerically labeled. Recorded patient information included age (by decade), sex, ethnicity, diagnosis (3-digit International Classification of Diseases, 9th Revision codes), and type of clinic (SBCMC or private). Charts of patients who had blood drawn were marked with a tag to avoid duplications. These tags were removed from the charts at the completion of data collection and before assay results were analyzed to eliminate the possibility of tracing results back to individuals.

The San Bernardino County Department of Public Health laboratory performed the HIV antibody tests. Specimens were tested by the enzyme-linked immunosorbent assay (ELISA), and the direct immunofluorescent antibody (IFA) assay was used as a supplemental test. The ELISA is a test designed to screen for as many potential HIV-positive patients as possible. The IFA test is used to confirm those samples that tested HIV-positive on the ELISA. For the purposes of this study, a sample was considered HIV-positive only if it was positive on both of these tests. Samples with a positive ELISA and negative IFA test were considered HIV-negative. Positive results could not be traced back to the individual.

Chi-square tests were used to test significance for differences in proportions for categorical variables. Age standardization was performed by the direct method using the total 1990 San Bernardino County population as the standard.<sup>4</sup> For prevalence data, age- and race-standardized rates were calculated for the San Bernardino clinics and for the private clinics. To obtain standardized rates, age and race distributions from the 1990 census for the San Bernardino population were used to weight crude age- and race-specific prevalence rates. Ninety-five percent confidence intervals for the prevalence in the two clinics' populations were estimated using Poisson models.<sup>4</sup>

### Results

#### Overall Results

A total of 3874 sera samples were collected. The percentage of patients at each clinic who had blood drawn for this study ranged from 5.2 percent at East Highland to 7.4 percent at West San Bernardino. The sex and ethnic distributions for the sample were similar to those of the general patient population of the clinics studied (Table 1); however, the average age of subjects in the sample was slightly older than that of the general clinic population.

Of the patients included in this study, 34 percent were being seen for diabetes mellitus, hypertension, or a routine medical examination. This proportion is comparable to the 25 percent of visits these diagnoses represented for all patients seen at the medical center and private practice clinics. The average number of annual visits per patient was 2.4 at SBCMC and 1.6 at the private family practice clinics.

**Table 1. Demographic Characteristics of Study Population.**

Characteristics	Percent Patients SBCMC Clinics		Percent Patients Private Clinics	
	All (n = 18,795)	Sera Sampled (n = 3279)	All (n = 9917)	Sera Sampled (n = 595)
<b>Sex</b>				
Male	31	33	44	43
Female	69	67	56	57
<b>Race</b>				
White	36	36	74	76
African-American	14	15	7	6
Hispanic	32	39	16	16
Asian	1	1	2	*
Native-American	*	*	*	—
Other or missing	17	1	3	2
<b>Age (years)</b>				
< 10	15	1	18	*
20-29	10	2	11	4
30-39	18	9	12	10
40-49	19	12	18	18
50-59	14	18	14	19
60+	12	29	8	13
	13	28	20	35

\*Less than 1%.

Fifty-nine of the 3874 sera samples (1.52 percent) collected tested HIV positive on both the ELISA and IFA tests (Table 2). These HIV-positive patients were mostly men, and all were older than 20 years of age. HIV or AIDS was the "reason for visit" (or primary diagnosis listed at the visit) for 43 of the 59 HIV-positive patients. The 16 HIV-positive patients without HIV or AIDS listed as the reason for visit (as recorded by the nurse) (age- and race-adjusted prevalence = 0.45 percent) were between the ages of 20 and 59 years, with the 30- to 39-year-old age group having the highest rate of infection (1.41 percent) (Table 3). Based on these 16 cases, seroprevalence was eight times higher for men than women ( $\chi^2 = 14.3$ ,  $P = 0.0002$ ), and rates for African-Americans (0.85 percent) were two to three times higher than for Hispanics (0.40 percent) and whites (0.25 percent). No Asians or American Indians tested HIV-positive.

**SBCMC Clinics**

There were 3279 sera samples collected at the SBCMC sites (Table 1). Thirty-one tested HIV-positive on the ELISA, and 23 of these samples tested HIV-positive on the IFA test (prevalence = 0.7 percent). None of the 8 patients who had a positive ELISA and negative IFA was seen for HIV or AIDS. Of the 23 patients positive on both tests, 9 were seen for HIV or AIDS when

the blood samples were drawn; the remaining 14 (prevalence = 0.43 percent) (Table 3) were seen for diagnoses unrelated to HIV infection. The age- and race-adjusted prevalence rate using the county population as a standard was 0.46 percent.

**Table 2. Rates of HIV Seroprevalence for All Patients.\***

Characteristics	Percent Patients SBCMC Clinics (n = 23) <sup>†</sup>	Percent Patients Private Clinics (n = 36)	Percent Patients Total (n = 59) <sup>†</sup>
<b>Sex</b>			
Male	1.78	12.02	3.77
Female	0.14	1.49	0.32
<b>Race</b>			
White	0.51	5.36	1.85
African-American	1.08	5.26	1.35
Hispanic	0.70	10.75	1.32
Other	—	—	—
<b>Age (years)</b>			
< 10	—	—	—
10-19	—	—	—
20-29	1.95	8.47	3.00
30-39	2.21	16.51	5.23
40-49	0.84	6.09	1.69
50-59	0.21	6.49	0.69
60+	—	0.48	0.09
<b>Total</b>	0.70	6.05	1.52

\*Based on IFA test results.

<sup>†</sup>Includes 1 case with missing sex, race, and age.

**Table 3. Rates and 95 Percent Confidence Intervals of HIV Seroprevalence, Excluding Visits with HIV or AIDS Diagnoses.\***

Characteristics	Percent Patients (95% CI) SBCMC Clinics (n = 14) <sup>†</sup>	Percent Patients (95% CI) Private Clinics (n = 2)	Percent Patients (95% CI) Total (n = 16) <sup>‡</sup>
<b>Sex</b>			
Male	1.04 (0.52–1.86)	0.44 (0.01–2.45)	0.93 (0.48–1.63)
Female	0.09 (0.01–0.32)	0.30 (0.01–1.67)	0.12 (0.02–0.35)
<b>Race</b>			
White	0.34 (0.09–0.87)	—	0.25 (0.07–0.64)
African-American	0.73 (0.20–1.87)	2.70 (0.07–15.04)	0.85 (0.28–1.98)
Hispanic	0.35 (0.11–0.82)	1.19 (0.03–6.63)	0.40 (0.15–0.87)
Other	—	—	—
<b>Age (years)</b>			
< 10	—	—	—
10–19	—	—	—
20–29	0.33 (0.01–1.84)	1.82 (0.05–10.14)	0.56 (0.07–2.02)
30–39	1.73 (0.69–3.56)	—	1.41 (0.57–2.90)
40–49	0.84 (0.27–1.96)	—	0.71 (0.23–1.65)
50–59	—	1.37 (0.03–7.63)	0.10 (0.00–0.56)
60+	—	—	—
<b>Total</b>	0.43 (0.23–0.72)	0.36 (0.04–1.30)	0.42 (0.24–0.68)
<b>Weighted total<sup>‡</sup></b>	0.46 (0.26–0.76)	0.41 (0.05–1.48)	0.45 (0.26–0.72)

\*Based on IFA test results.

<sup>†</sup>Includes 1 case with missing sex, race, and age.<sup>‡</sup>Age- and race-adjusted rates.**Private Family Practice Clinics**

There were 595 sera samples collected from the private clinics (Table 1). Thirty-six samples tested HIV-positive on both the ELISA and IFA tests. (All ELISA-positive sera samples were IFA-positive.) All except 2 of the 36 patients were seen for HIV or AIDS; thus, the prevalence rate of HIV infection was 0.36 percent in the subsample of patients whose visits were unrelated to HIV or AIDS (Table 3). The age- and race-adjusted prevalence rate using the county population as a standard was 0.41 percent.

**Discussion**

In this anonymous HIV seroprevalence study of family medicine outpatients, 59 of the 3874 patients (1.52 percent) tested HIV positive. When those patients seeking medical care for illnesses or diagnostic work-ups related to AIDS were excluded from the analysis, the age- and race-adjusted prevalence rate of HIV infection was 0.45 percent. Although the data presented here reflect the prevalence rate of HIV infection in a selected group of outpatients, the results are very similar to prevalence rates reported in more general surveys. For example, a 0.35 percent HIV prevalence rate was found among sentinel hospitals in the

western United States.<sup>5</sup> Our results are also congruent with recent estimates that 0.5 percent of Californians are living with HIV infection.<sup>6</sup> In addition, the estimated 0.34 percent prevalence rate of HIV infection in counties exclusive of San Francisco, Los Angeles, and San Diego is very similar to the results of our study. It should be noted, however, that lower rates have been reported for members of the Kaiser Permanente Medical Care Program in Northern California (0.2 percent).<sup>7</sup>

Generalizing results of epidemiologic studies in medical care settings to the general population must be done with caution for several reasons. First, it is not known whether HIV-infected persons are more or less likely to seek medical care than uninfected individuals.<sup>8</sup> Consequently, the inclusion of known HIV-infected individuals in studies based in medical settings might result in an inaccurate estimate of the true HIV prevalence. An attempt was made to control for this possible bias by analyzing data separately for those whose reason for visit was HIV or AIDS from the others. Of the 59 HIV-positive patients, 43 were visiting the clinic for HIV-related reasons. Of the 16 remaining HIV-positive patients, 3 had data forms that were missing a diagnosis and



13 patients had some other reason listed as the reason for visit. To estimate how many of the latter 13 patients might already be known to be HIV positive, we compared their reasons for visit against a list of conditions that might presumptively be expected to occur more frequently among persons infected with HIV. The criteria that we used (i.e., diagnoses, such as infectious disease, neoplasms, hemophilia) have been described elsewhere in detail.<sup>8</sup> Three cases met the criteria, one each for pneumonia, rash, and tuberculosis.

Another reason for caution is that the medical settings used in the study can bias results. For example, in the current study the higher rates of seroprevalence in the private clinics could reflect attitudes of physicians at those clinics. Private physicians who were willing to participate in seroprevalence studies could have a special interest in treating HIV or AIDS patients. Because of their interests, these physicians could conceivably attract more high-risk patients to their practices, thereby inflating seroprevalence rates. By excluding patients specifically seeking HIV- or AIDS-related care, it is possible to reduce (but not completely eliminate) this source of bias.

The exclusion of patients already known to be HIV positive can illuminate possible differences in seroprevalence rates among ethnic groups. When all sera sampled are included in the analysis, HIV seroprevalence rates are similar for African-Americans (1.35 percent), whites (1.85 percent), and Hispanics (1.32 percent) (Table 2). When patients being seen for HIV or AIDS are excluded, however, the age-adjusted rate among African-Americans (1.02 percent) is about three times higher than among whites (0.35 percent) and Hispanics (0.35 percent). These latter results are consistent with other surveys indicating that African-Americans are overrepresented among AIDS cases in California. Although African-Americans make up about 7 percent of the population, they make up 12 percent of diagnosed AIDS cases in California.<sup>9</sup> Furthermore, when the patients seeking care for HIV are excluded, the HIV seroprevalence rates for Hispanics and whites are similar, a finding that is consistent with the results of other studies.<sup>10</sup>

Several characteristics of this study enhance its usefulness. Because the reason for the office visit was recorded, it was possible to obtain a more accurate estimate of the rate of undiagnosed HIV

infection than has been possible in previous studies. In addition, samples of family medicine outpatients might more accurately reflect the health of the general population than samples of patients who are hospitalized or are seeking specialized care.<sup>8</sup> Furthermore, by anonymously testing all patients who had blood drawn rather than testing only those who would consent to an HIV test, self-selection bias was minimized.

HIV has proved to be heterogeneous in its impact on communities within the United States. Locally applicable data, such as the data collected in our survey, are therefore essential for predicting future health manpower needs and evaluating disease-prevention strategies in specific geographic areas.<sup>11</sup> Based on the age- and sex-specific HIV seroprevalence rates from this study and county census figures, we estimate that there are approximately 7800 HIV-infected persons residing in San Bernardino County. Using a predicted average cost of care per patient of \$102,000,<sup>12</sup> it is estimated that \$796 million will be required to treat these patients. In addition to predicting future health resource needs, seroprevalence studies conducted on an on-going basis can serve as valuable tools for monitoring the spread of HIV infection and for developing and evaluating the effectiveness of intervention strategies.

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## References

1. 1990 census of population and housing summary population and housing characteristics. United States, California. Washington, DC: Superintendent of Documents, US Government Printing Office, 1991.
2. California HIV prevalence estimates and AIDS case projections. California HIV/AIDS Update 1992; 5(1):1-7.
3. Kurata JH, Lewis CE, Chetkovich DM, Morton A, Werblun MN. AIDS in California family medicine: Changing experiences, knowledge, and geographic distributions. *J Fam Pract* 1991; 32:155-60.
4. Lilienfeld AM, Lilienfeld DE. Foundations of epidemiology. New York: Oxford University, 1980:75-8.
5. St. Louis ME, Rauch KJ, Petersen LR, Anderson JE, Schable CA, Dondero TJ. Seroprevalence rates of human immunodeficiency virus infection at sentinel hospitals in the United States. The Sentinel Hospital Surveillance Group. *N Engl J Med* 1990; 323:213-8.
6. Hiehle G, Maxfield WT, Kizer KW. Medi-Cal studies in AIDS. Demographics and expenditures for

- persons with AIDS, 1980-1989. State of California, Department of Health Services, March 1990.
7. Hiatt RA, Capell FJ, Ascher MS. Seroprevalence of HIV-type 1 in a northern California health plan population: an unlinked survey. *Am J Public Health* 1992; 82:564-7.
  8. Petersen LR, Calonge NB, Chamberland ME, Engel RH, Herring NC. Methods of surveillance for HIV infection in primary care outpatients in the United States. *Pub Health Rep* 1990; 105:158-62.
  9. Jew S. AIDS among African-Americans in California. *California HIV/AIDS Update* 1991; 4(2):12-23.
  10. Romanowicz P, Lloyd J. AIDS among California Hispanics. *California HIV/AIDS Update* 1989; 2:137-9.
  11. Dondero TJ Jr, Curran JW. Serosurveillance of human immunodeficiency virus infection. *Am J Public Health* 1991; 81:561-2.
  12. Agency for Health Care Policy and Research. HIV treatment may cost \$15 billion by 1995. *Research Activities* 1992; 155(July):1-2.