A Descriptive Epidemiologic Study of HIV-Infected Individuals in Hawaii: Report of the Hawaii Sero-Positivity and Medical Management Database (HSPAMM)

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Abstract

This is a retrospective study of the HSPAMM database evaluating differences in clinical, laboratory, HIV-risk factors and demographic characteristics with respect to gender and ethnicity. There were no significant differences comparing gender, and Hawaiians and non-Hawaiians with respect to developing a CD4 count <200 cells/mm^3. HSPAMM contains information on a large number of HIV-infected Asians/Pacific Islanders.

Introduction

The State of Hawaii Department of Health estimates that there are between 2,300 to 3,200 individuals living in Hawaii who are infected with the human immunodeficiency virus (HIV). Since 1989, the Hawaii Sero-Positivity and Medical Management (HSPAMM) program has provided a means to monitor HIV infection within the state. The purpose of HSPAMM is to (1) encourage those who are HIV infected or at risk for HIV infection to consult a physician to prevent disease progression, (2) provide ongoing clinical assistance to participants, (3) classify groups of infected people by specific criteria so that they may participate in clinical trials and research, and (4) maintain anonymous demographic, clinical and laboratory records about participants. The HSPAMM program provides semi-annual visits for all its participants with their own primary care physicians. An HSPAMM visit consists of a patient questionnaire, a health provider questionnaire, a general physical examination, and collection of laboratory samples. We report the descriptive epidemiological analysis of the HPSAMM database covering April 1989 to July 2001. The purpose of the study was to define whether differences exist in clinical, laboratory findings, HIV-risk factors and demographic characteristics with respect to gender and ethnicity.

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Methods

An overview of how data are obtained through HSPAMM is displayed in Figure 1. The patient questionnaire is self-administered and consists of 43 questions, which include the patient's demographics, risk factors, medical history, medication use, and signs and symptoms. Ethnicity was defined as Caucasian, African American, Hispanic, American Indian, Asian/Pacific Islanders, and other ethnicities. Asian/Pacific Islanders were further classified as Chinese, Japanese, Filipino, Hawaiian/Part Hawaiian (individuals who report having any Hawaiian heritage), and other Asians not of Hawaiian descent. The questionnaire given at each HSPAMM visit is repeated and intended to capture changes within the interim period. The physician medical history includes the patient's clinical signs, symptoms, health status, onset of opportunistic infections, and development of HIV associated diseases. The general physical examination, included in the physician medical history section, records the patient's vital signs and review of all organ systems. The laboratory portion of the HSPAMM visit includes CD4/CD8+ counts, HIV viral load, chemistry panel (electrolytes and liver function tests), complete blood count with white blood count differential, Papanicolaou testing for women, and hepatitis B and C serologies. All data collected from participants are recorded under an individualized code number, in which only the treating clinician knows the name of the participant, so as to insure confidentiality.

This is a retrospective descriptive epidemiologic study of HSPAMM participants from April 1989 to July 2001. During this period there were minor modifications to the questionnaires and laboratory testing. These modifications were made in response to the increased awareness of the natural progression of HIV disease, availability of anti-retroviral medications and other medications used to treat HIV complications, and improved laboratory technology. There were a total of 722 variables collected from the patient questionnaire, physician medical history, and laboratory tests.

The data were analyzed using SPSS version 10 (SPSS Inc., Chicago, IL) and STATA version 7 (StataCorp, College Station, TX). Descriptive epidemiological analyses were performed on all variables. Group differences within gender, ethnic, and risk factors were compared using one-way analysis of variance. Significant differences across these groups were indicated by the F-test. The

source of inter-group differences was determined by using a two-sided t-test. An alpha level less than 0.05 was considered significant.

An unadjusted Cox proportional hazards model was used to compare the rate of developing a CD4 count <200 cells/mm^3 among men and women who had an enrollment CD4 count ≥ 200 cells/mm^3. Potential risk factors for developing a CD4 count< 200 cells/mm^3 was examined by using multivariate proportional hazards models adjusted for ethnicity, enrollment CD4 count, and history of anti-retroviral therapy. Similarly, a Cox proportional hazards model was used to compare Hawaiians and non-Hawaiians in developing a CD4 count < 200 cells/mm^3, and adjusted for enrollment CD4 count and history of anti-retroviral therapy. The risk of developing a CD4 count of <200 cells/mm^3 was used since this is an acquired immunodeficiency syndrome (AIDS) defining event. Other AIDS defining events were not consistently captured by HSPAMM.

Results

From April 1989 to July 2001 there have been 2,460 HSPAMM participants resulting in 12,832 visits. Incomplete visits, defined as having one or more missing questionnaires (patient questionnaire, physician medical history, and laboratory panel) in a visit, were detected in 758 (5.9%) visits. Of all visits, there were 698 missing patient questionnaires, 698 missing physician medical histories, and 491 missing laboratory sections. The median follow-up was four 6-month interval visits, with a mean follow-up of six 6-month interval visits. Of all participants, 19% made a single visit, 12% made 2 visits, 10% made 3 visits, and 59% made 4 or more follow-up visits. There were no differences between length of participation and gender. African Americans had a substantially shorter length of participation compared to other ethnic groups (4.8 visits compared to 6.3 visits). Length of participation increased with increasing income and among the men having sex with men (MSM) population. The average length of HIV infection prior to enrolling in HSPAMM was 3.8 years (median of 2.0 years). Annual enrollment by ethnicity is displayed in Figure 2.

From the patient questionnaire database, 2221 (90.7%) were male, 196 (8.0%) were female, and 33 (1.3%) had no response. The age of these participants at their initial visit ranged from18.0 to 71.1 years (mean age = 37.2 years; median age = 36.2 years; mode age = 37.0 years). Among participants over the past two years, participants over the age of 50 made up 27.9% of the current database. The demographic characteristics of the HSPAMM database is shown in Table 1. The distribution of participants residing on each island is shown in Figure 3.

The length of residence in Hawaii at first enrollment ranged from <1 year to 68 years (mean = 11.3 years; median = 5.0 years; mode less than 1 year). At first enrollment, participant who moved to Hawaii within 1 year tended to be younger (median age of 37 and mode age of 24) compared to participants who had resided here for > 5 years (median age of 40 and mode age of 43). Risk factors for HIV disease are displayed in Table 1. Of all participants reporting injection drug use (IDU) on their initial HSPAMM visit, 50.1% (173) reported sharing needles on a regular basis with an average of 2.3 individuals (median 2.0). The average of HSPAMM visits found 22.4% of participants report using nitrate inhalants, 49.4% marijuana, 17.8% inhaled cocaine, 9.3% methamphetamines, 3.2% IV cocaine, and 1.8% IV heroin. The facilities where participants received their initial HIV positive test were sexually transmitted disease (STD) clinics (39.1%), physician offices (31.1%), other health clinics / hospitals (24.1%), blood banks (1.9%), and no response (3.8%).

At enrollment, 1456 of all participants reported an income less than $20,000 (63.1%). The number of men and women according to stratified incomes at enrollment are displayed in Table 1. For participants with two or more follow-up visits, reported income on subsequent visits did not change significantly from that reported at enrollment (mean change in individual income stratification was +0.7with a standard deviation of ± 1.1). At the initial visit, the housing situation was as follows: 12.3% owned their own home, 57.2% rented, 11.8% were in temporary housing, 2.7% were homeless, and 0.6% were in shelters (15.4% did not respond). Of the 66 homeless individuals, 40.0% (26) went on to find housing situations while the rest continued to be homeless.

The average CD4 count at enrollment was 357 cells/mm^3 for men (median 330) and 399 cells/mm^3 for women (median 350). Of 2,460 participants, 1,657 participants had an enrollment CD4 count ≥ 200 cells/mm^3. There were no significant difference in the cumulative proportion of men and women in developing a CD4 count of <200 cells/mm^3 (Hazard Ratio of 0.98, 95% CI [0.69, 1.39], P=0.91). This finding was unchanged even after adjustment for ethnicity, enrollment CD4 count and history of anti-retroviral therapy use (Hazard Ratio of 1.07, 95% CI [0.74, 1.55], P=0.70) (Figure 4).

The ethnic distribution according to stratified CD4 counts at enrollment is displayed in Table 2. There were minimal differences in stratified CD4 counts between ethnic groups except between Hawaiians and non-Hawaiians. There was a significant difference of 40 cells/mm^3 in mean CD4 counts between Hawaiians and non-Hawaiians at enrollment. Hawaiians had a median enrollment CD4 count of 80 cells/mm^3 lower than non-Hawaiians, with largest difference between Hawaiians and Caucasians of 128 cells/mm^3. However, no difference in proportional hazards was seen between Hawaiians and non-Hawaiians in developing a CD4 count <200 cells/mm^3 (Hazard Ratio of 1.20, 95% CI [0.86, 1.68], P=0.30), even after adjustment for enrollment CD4 count and history of anti-retroviral therapy (Hazard Ratio of 1.02, 95% CI [0.72, 1.45], P=0.91).

Discussion

Since 1989, HSPAMM has provided the State of Hawaii Department of Health insight into the demographics and health behavior of this unique group of HIV-infected individuals. Although not all HIV-infected individuals living in the state participate in HSPAMM, this group constitutes the largest HIV database in Hawaii. The database is unique in that it allows us to examine the demographic, clinical and laboratory status of a large HIV-infected population living in the State. Although the median follow-up is four 6-month interval visits, 20% of participants have been followed over 5 years. Enrollment of participants was initially high at about 300 per year in early 1990's and has subsequently declined. Recent years have seen HSPAMM enrollment steady at 110-150 per year (although follow-up and utilization have increased steadily over time). This trend is proportional to the estimated incidence of HIV infection in Hawaii.[1] Possible etiologies for this decline are fewer HSPAMM enrollment, HIV conversion or HIV-infected individuals moving to the state.

Figure 1.– Overview of the HSPAMM visit

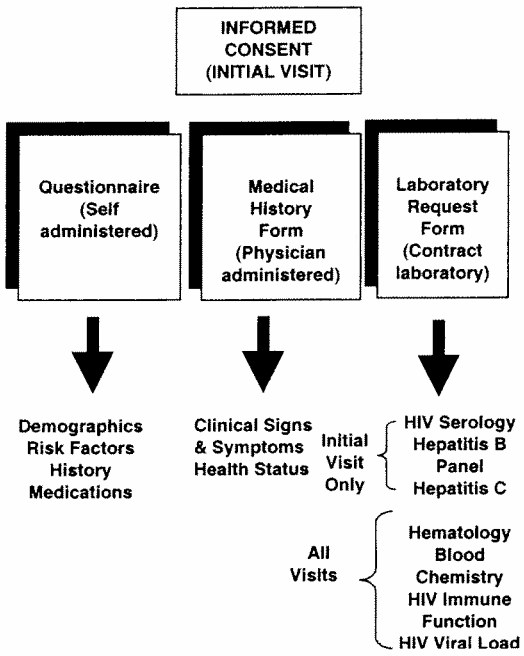
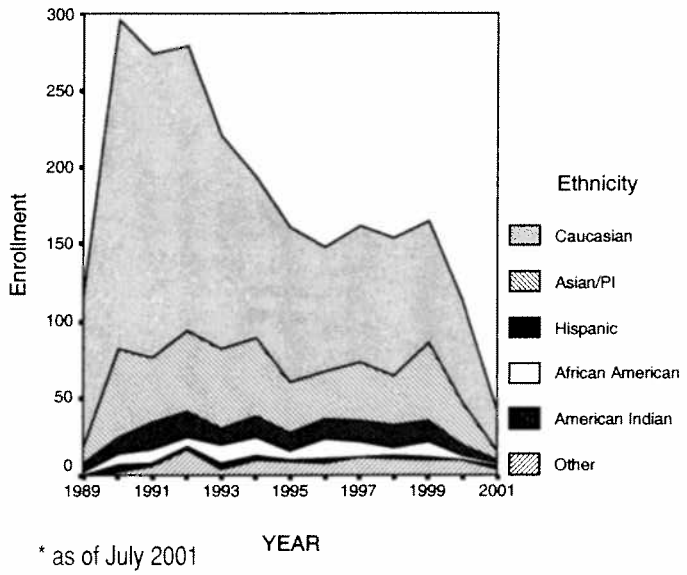


Figure 2.– Annual HSPAMM enrollment by ethnicity*



* as of July 2001

Figure 3.– Distribution of HSPAMM participants living in Hawaii

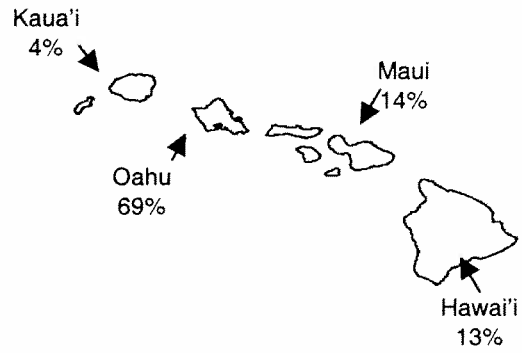
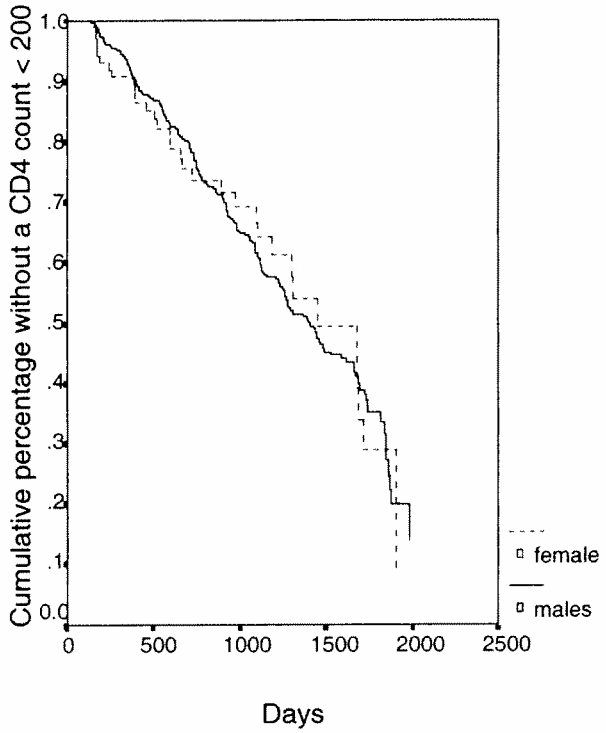


Figure 4.– Cumulative proportional of HSPAMM participants remaining free of developing a CD4 count < 200 cells/mm3 according to gender, adjusted for ethnicity, enrollment CD4 count, and history of anti-retroviral therapy



Although Hawaii is composed of a wide ethnic diversity, Caucasian males are disproportionately infected with HIV compared to other groups. The 2000 Census shows that of the 1,211,537 people living in the state, 41.6% are Asian (503,868), 24.3% are Caucasian (294,102), 9.4% are Hawaiian/Pacific Islander (113,539), 1.8% are African Americans (22,003), and 21.4% are Mixed Non-Hawaiians (259,343).[2] The number of Caucasians is disproportionately infected when compared to other ethnic groups living in Hawaii. The large number of Asian/ Pacific Islanders contained in this database makes this one of the largest database of HIV infected Asian/ Pacific Islanders in the country. Asian/ Pacific Islanders make up 20.7% of the HSPAMM database compared to less than 1% of all case surveys in the national AIDS Surveillance database.[3] The Asian HSPAMM participants are similar to national AIDS surveillance demographics in that the majority of participants are MSM (70% compared to 79% nationally).[4]

A large proportion of younger participants were found to have recently moved to Hawaii at enrollment. This migration to the State may be secondary to the better health coverage, the HIV Drug Assistance Program, and environmental/social atmosphere in Ha-

Table 1.– Demographic characteristics of HSPAMM participants

	Male	%	Female	%
Total	2224	92%	196	8%
Active Participants	761	89%	94	11%
Ethnicity				
African American	92	4%	9	4%
American Indian/ Alaskan Native	26	1%	2	1%
Asian/ Pacific Islander	425	19%	76	39%
Caucasian	1422	64%	84	44%
Hispanic	146	7%	12	6%
Other	110	5%	13	5%
Asian / Pacific Islanders				
Hawaiian/ Part Hawaiian	216		39	
Filipino	51		10	
Japanese	56		9	
Chinese	51		6	
Other Asian	51		12	
Risk Factors				
Men who have sex with men (MSM)	1694	77%	-	-
Injecting drug use (IDU)	82	4%	7	4%
MSM/IDU	187	8%	-	-
Heterosexual Contact	90	4%	120	60%
Blood/ blood products	6	(<1%)	9	5%
Other	162	7%	60	31%
Per Capita Income ($)				
<10,000	854	40.2%	109	60.9%
10,000 - 19,999	458	20.6%	32	16.3%
20,000 - 29,999	296	13.3%	19	9.7%
30,000 - 39,999	192	8.6%	9	4.6%
40,000 - 49,999	106	4.8%	5	2.6%
50,000 +	217	9.8%	5	2.6%
Length of Residency				
< 1 year	528	23.8%	40	20.4%
1-5 years	597	26.9%	30	15.3%
6-10 years	294	13.2%	25	12.8%
10+ years	733	33.0%	93	47.4%
No response	69	3.1%	8	4.1%

Table 2.– Ethnic distribution according to stratified CD4 counts at enrollment

	CD4 Count (cells/mm^3)					
	≤ 50	51-100	101-200	201-350	351-500	>500
American Indian/ Alaskan Native	2	1	3	12	5	8
Asian/ Pacific Islander	60	45	81	114	75	102
African American	15	5	8	17	24	25
Caucasian	138	81	171	335	301	411
Hispanic	20	9	16	33	31	41
Other	16	9	21	36	26	31
Asian / Pacific Islanders						
Hawaiian/ Part Hawaiian	39	26	57	60	48	62
Filipino	11	3	5	13	13	13
Japanese	7	4	13	21	15	18
Chinese	3	2	6	13	5	3
Other Asian	16	3	6	21	9	17

waii compared to many parts of the country. Interestingly, seven physicians were responsible for seeing over 50% of HSPAMM visits. These 7 physicians are all known members of an association called the Community Consortium of AIDS Physicians Hawaii, a physician group that was formed with the purpose of improving HIV health care, research and awareness in the State.

The HSPAMM database consisted of older participants compared to the national average.[5] Participants greater than the age of 50 make up 25.8% of all active participants. Butt AA, et al. report that HIV infected individuals with an age greater than or equal to 60 years was associated with shorter survival compared to HIV non-infected individuals.[6] The health and resource needs of this population can also be expected to change as more infected individuals enter their golden years, and increasing emphasis may need to be directed towards health issues focusing on cardiovascular disease, HIV lipodystrophy, osteoporosis, and dyslipidemia.

HSPAMM includes HIV-infected individuals with and without a prior diagnosis of AIDS. The treatment of HIV disease is comparable to that seen nationally. There were 234 HSPAMM participants who transitioned from monotherapy or no anti-retroviral therapy to highly active anti-retroviral therapy (transition period occurring between 1995-1996). Results are similar to the Multicenter AIDS Cohort Study (MACS), in that the use of highly active anti-retroviral therapy (HAART) dramatically increased CD4 counts.[7]

Among men, MSM constituted the majority of HSPAMM participants (69%), slightly higher than that seen nationally (54%).[5] Women made up 8.0 percentage of the database, much less than seen nationally (32%).[5] The prevalence of HIV infection in women is unknown since HIV infection is not a reportable disease. The etiology of this gender disparity in HSPAMM is not known, but may suggest cultural and social barriers faced by infected women. There were socioeconomic differences between men and women. Women reported a lower education status (40% having attended college compared to 64% in men) and lower household income compared to men. However, the women participants in HSPAMM had comparable immunologic status to male participants. The women had a higher enrollment CD4 count. As seen in Figure 4, there was no significant difference in the cumulative proportion of men and women in developing a CD4 count of <200 cells/mm^3, even after adjustment for ethnicity, enrollment CD4 count and history of anti-retroviral therapy use.

Hawaiians comprise 10% of the entire database and are the largest group secondary to Caucasians. Although no difference in proportional hazards was seen between Hawaiians and non-Hawaiians in developing a CD4 count <200 cells/mm^3, the enrollment median and mean CD4 counts of Hawaiians were lower than that of non-Hawaiians, especially Caucasians. These differences persist with respect to visit sequences. The median and mean CD4 counts of Hawaiians appear parallel to counts seen in non-Hawaiians at each sequence. This difference was no longer seen after Hawaiians were stratified to enrollment CD4 counts. This may suggest that although Hawaiians respond to anti-retroviral therapy similarly to other ethnic groups, they seek medical attention for their HIV infection later than the other groups. Cultural, socioeconomics and access to care issues will need to be addressed in future studies.

Limitations of this retrospective study of the HSPAMM database are mainly from the construction of the database. The database is one

that is anonymous. Therefore, validation of data collected is difficult to perform and linkage to vital statistics unfeasible. Participants who drop out of HSPAMM are also difficult to locate. Controls were not intended and therefore results of this database are descriptive and hypothesis generating. The anonymous nature of the program allows for the possible duplication of participants, although procedures are in place to prevent duplication.

There are two major sources of bias which preclude generalization to the HIV-infected population at large. The first is that the cohort is self-selected. Participation is voluntary and there are many potential barriers to patient enrollment: denial, economic and cultural factors, geographic isolation, and some physician aversion to paper work. The second source of bias is that a large portion of the first year's enrollment included only MSM from a previous cohort established in 1985 called the Hawaii Men's Study.[8]

Describing representative populations such as HSPAMM helps prioritize and efficiently use human and fiscal resources for disease control and prevention purposes. Flexibility in modification and additions to the questionnaire, and clinical and laboratory database can assist administrators and health providers in asking pertinent health care questions for the future. In addition, HSPAMM provides necessary services and information to the large proportion of HIV infected individuals living in Hawaii.

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