

Analysis of CD4 counts of HIV patients: Focused on gender, drug use, ethnicity, age and homelessness

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Abstract:

This study was conducted on HIV patients in an urban area. Researchers wanted to study the relationship between drug use, ethnicity, age, gender and CD4 counts. CD4 refers to all-purpose cells in the human immune system. The purpose of these cells is to notify your immune system when a viruses or bacteria have been detected in the body. Participants in this study are also apart of a larger study focusing on connections between clinical and psychosocial influences on HIV/AIDS therapy. In this cohort study, participants are interviewed twice in a six-month interval. Medical records and pharmaceutical records are recorded at both interviews.

Participants for this study were randomly recruited on a daily basis from an urban AIDS clinic. Researchers

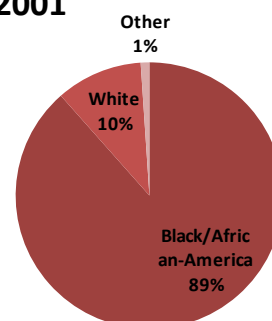
attempted to keep the same unbiased and equally distributed so that it may be used as a representative sample.

However, for the current study, there were 89% of Black/African - American participants and 63% males. At both interviews, the same questionnaire is given. There is a chance of under-reporting for drug use due to the self-reporting survey methods of this study.

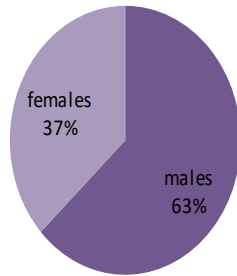
During the study, a specialty nurse used an appointment log to identify patients, potential participants and active participants. However, because all groups are not mutually exclusive, there had to be more variables added to separate the groups.

The following pie charts show the distribution of ethnicity and gender of our sample group.

**Ethnicity of 191 Participates
of HIV study of in urban
clinic, 2001**



**Gender of 191 Participates of HIV study
of in urban clinic, 2001**



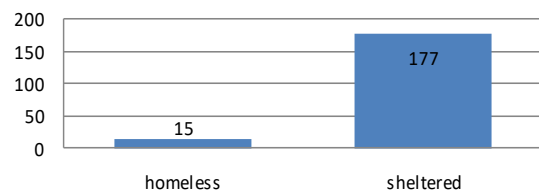
Introduction:

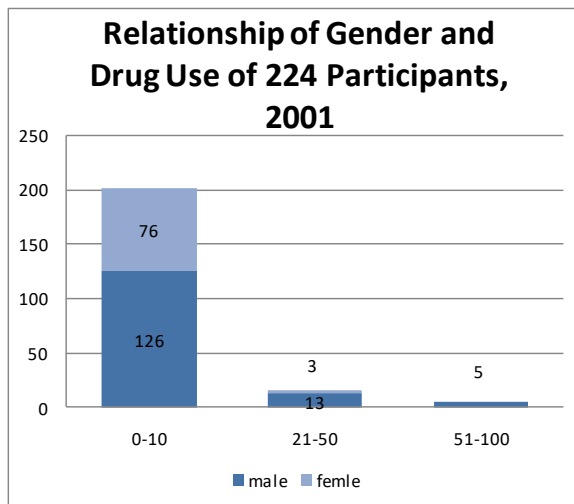
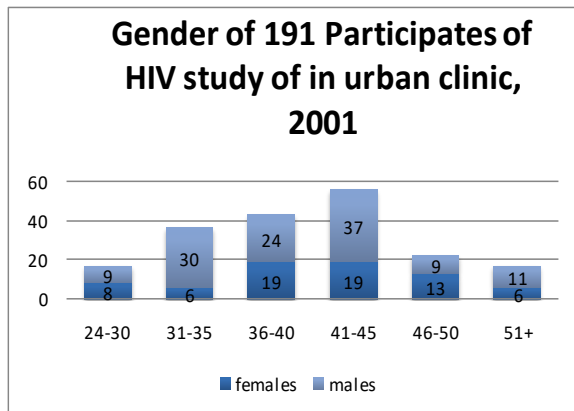
In order to conduct a cohort study involving HIV-infected patients of an urban city, we first must familiarize ourselves with the disease and the community. HIV/AIDS is a growing epidemic that was discovered only 30 years ago. Since its discovery, AIDS and HIV has claimed over 600,000 deaths in the United States alone and over a million people have been diagnosed with the disease (or virus) in the United States(1). Researchers need to familiarize themselves with the basic background of the disease (virus). For this study, it is also important to understand how CD4 counts relate to HIV and treatment. A high level of CD4 allows the human body to fight off

infections. As it relates to HIV patients it reduces complications and opportunities for infections. Once there is a basic understanding of the disease, we must select a community that can be used as a representative sample for the United States population as a whole. We have to get a sample that includes a relatively even distribution of males (both sexual preferences) and females, a variety of educational backgrounds, race, age and drug use over the six-month span of the study.

The following charts illustrate the primary variables used in our dataset.

**Homeless Ratio of 191
participates of HIV study,
2001**





Study Design:

Researchers were able to access a sample of 230-HIV infected participants from a large urban AIDS clinic. Participants were first given patients waivers for participation and promised to keep their identity anonymous. They were then interviewed. One interview is conducted at the beginning of the study and then another six months later. Of the 230

participants, Fifty-six percent were male, and forty-four percent were female. Respondents ranged in age from 26 to 69 years (mean = 40.31, Standard Deviation = 7.43). As previously stated, there were 89% of Black/African - American, 10% White, and 1% other.

In addition to the waivers, we offered participants a small fee to increase the interest in participation. Each participant was given twenty dollars at the first interview and then another twenty dollars after the second interview. This small compensation encouraged a second response of all participants. The same questionnaires are asked at both interviews and by all participants. After collecting all the data, we will begin testing our hypothesis. During testing, we are mindful to keep the numbers consistent. This is where researchers lost some participants due to lack of either initial or follow up data from the questionnaires. We also have

to be mindful that surveys and questionnaires have to account for misreporting due to lack of recollection or due to lack of omission (for fear of embarrassment or whatever reason the participants fail to report truthful statements).

The predictor variables will include gender, age, ethnicity, drug use and homelessness. The outcome variable is CD4 counts. The key to this study is determining what variables contribute to a decrease in CD4 counts. Our goal as researchers is to discover a way to increase CD4 counts for HIV patients. Before beginning this study, we did not see foresee gender as an indicator for CD4 count but we wanted to investigate the relationship farther. We also wanted to consider drug use since sharing needles for recreational drug use increases a person's change of transferring the disease and decreasing CD4 counts. Educational levels are an interesting concept and could be considered a predictor variable, but the original study did not include it as a variable. The original

study started the statistics in reference to educational levels but without the variable in the dataset, we are unable to determine if there is a connection between education and CD4 counts. The last predictor variable is homeless classification. Someone without a home may also have little access to medical facilities as well and without medical knowledge or treatment-- this may result in lower CD4 count.

Hypothesis:

Researchers will be using linear regression to determine if there is any interaction between gender, drug use, homelessness, ethnicity, age and CD4 counts. The first hypothesis tests the relationship between CD4 counts and gender. Researchers want to determine if there is a significant difference amongst gender and identify the mean CD4 counts of males and females. A second hypothesis will test interaction of age with the other variables, then gender interaction amongst the other variables and drug use interaction with the other variables. After testing for

interaction, we will use linear regression to test for confounding for those same variables. After the testing has concluded, researchers will be able to determine some causes of increase or decrease of CD4 counts for males and females and which gender is at a higher risk of having lower CD4 counts.

Analysis:

For this analysis, researchers want to know if males or females were more likely to have a lower CD4 count (T-cell count) and if there was a significant difference amongst gender. We started our data set with 230 participates but we had to deleted twenty-nine of those for this analysis. We lost thirteen percent of our dataset with those twenty-nine participates. Those participates did not identify their gender and therefore their CD4 counts were not valid. We started this analysis by separating the male CD4 counts and the female CD4 counts. Doctors recommend HIV patients began treatment if their CD4 counts fall to 350 or below so we based the Odd Ratios

on CD4 counts of 350 and below verse CD4 counts above 350. A normal CD4 can range from 500-1000 (2). From the descriptive statistics, we see that the mean male CD4 count is 250.3. We can say with 95% confidence that the true average is between 217.7 and 282.8. Seventy-one percent of the males have CD4 counts of 350 or below. The mean female CD4 count is 369.1 and we are 95% confident that the true average is between 313.9 and 424.3.

Gender	Mean	Lower CI	Upper CI	≥350 (Percent)
Male	250.3	217.73	282.77	71.20%
Female	369.1	313.87	424.31	44.70%

Based on these numbers alone, we see that on average females have higher CD4 counts. Only forty-five percent of females have CD4 counts that are 350 or below while seventy-one males' counts are 350 or lower. The two confidence intervals do not overlap; consequently, we see that there is a significant difference in CD4 count for gender. After calculating the odds ratio,

we see that males are three times more likely to have a lower CD4 count than females. We are 95% confident that the true odds are between 1.7 and 3.5.

Since this interval does not include one, this is further supporting that males are more likely to have a lower CD4 count.

For our second hypothesis we had to delete a total of thirty-nine cells which accounted for almost seventeen percent of the dataset. In this hypothesis, we used linear regression to determine if there was a relationship between the five variables selected. We used regression to determine if those variables were the cause of any increase or decrease in CD4 counts. Researcher first tested each variable independent relationship with CD4 counts. We used the beta from the regression model and the p-value to conclude if there was a relationship between the variable and CD4 counts. After testing the variables

independently, we paired each variable with a second variable and test the relationships again. After the second

	Chi-square	lower CI	upper CI
ODDS RATIO:	3.0539	1.684	3.5383

test, we note the new beta and the new p-value. The second test analyses for any interactions between variables.

Interaction	Beta	p-value
Age and Gender	-0.37	0.46
Age and Drug Use	0.04	0.2
Homeless and Age	2.22	0.14
Homeless and Ethnicity	80.57	0.18

If the p-values continue to be significantly high, we conduct a third test. On the third test, we test all the variables for any unknown relationships with CD4 counts. This test determines if there is any confounding.

Confounding	Beta	p-value
Homeless	68.43	0.25
Ethnicity	3.36	0.43
Age	-1.66	0.41

Results:

In this study, we learned that males are at 3 times more risk than females to have a lower CD4 count. This is confirmed by the odds ratio and by linear regression. We were unable to find any prove of interaction or confounding. We tested all five variables paired with another and used linear regression. All the p-values were significantly high with the exception of gender. This p-value can be explained but the odds ratios and the chi-square we tested in our first hypothesis. We saw some possible indication of interaction of ethnicity and homelessness but could not make a strong conclusion due to the heavy concentration of African - Americans and the very small sample of homeless participants.

References:

(1)"AIDS Pandemic." *Wikipedia, the Free Encyclopedia*. Wikimedia Foundation, Inc., 1 Dec. 2010. Web. 7 Dec. 2010. <http://en.wikipedia.org/wiki/AIDS_pandemic>.

(2) "CD4 Count." *Welcome to AIDS.gov*. Web. 7 Dec. 2010. <<http://aids.gov/hiv-aids-basics/diagnosed-with-hiv-aids/understand-your-test-results/cd4-count/>>.

(3) *The White House*. Web. 7 Dec. 2010. <http://www.whitehouse.gov/>.