



An alternative methodology for determining stage of HIV infection: Comparing most recent CD4 count or percent to "once stage 3, always stage 3"

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The Centers for Disease Control and Prevention (CDC) classifies HIV infection into disease stages, based on laboratory criteria or the presence of AIDS-defining conditions (opportunistic infections commonly associated with late-stage HIV infection, or AIDS). Stages 1 and 2 include all persons with a CD4+ T-lymphocyte count of ≥ 200 cells/mL of blood or a CD4+ T-lymphocyte percentage of $\geq 14\%$ of the total lymphocytes, and the absence of an AIDS-defining condition. Stage 3 includes persons with a CD4 count of < 200 cells/mL of blood or a CD4 percent of $< 14\%$, or the presence of an AIDS-defining condition.

Once an individual is diagnosed with HIV stage 3, he/she remains in the stage 3 category for the rest of his/her life. Historically, this categorization method of "once stage 3, always stage 3" accurately reflected HIV disease progression (persons did not usually recover from HIV stage 3). However, due to modern advances in anti-retroviral therapy and improved medical care for HIV-positive persons, it is relatively common for an HIV-positive individual to improve his/her CD4 count and/or percentage after an initial stage 3 diagnosis. Today, the "once stage 3, always stage 3" method of categorizing HIV-positive individuals does not reflect the true burden of HIV stage 3 in the population. A more accurate way to measure the prevalence of HIV stage 3 is important, because stage 3 is an indicator of increased mortality and risk of transmission due to higher viral load. In this analysis, the results of the "once stage 3, always stage 3" method are compared to results from a new method using the most recent CD4 count or percent to categorize persons into HIV stages.

This new methodology has several limitations. There is no time limit on the most recent CD4 count or percent used to determine HIV infection stage; therefore, some persons without recent laboratory data may be classified incorrectly. Additionally, some HIV-positive persons do not have any CD4 counts or percents with which to determine their stage. As a result, the stage of 8% of prevalent cases is unknown. The CDC continues to use the original methodology to determine stage of infection, so this new methodology will be used only for this analysis and not for other data products released by MDCH.

As table 1 shows, only 18% of all prevalent HIV infection cases living in Michigan as of January 2013 are classified as stage 3 by assessing the most recent CD4 count or percent, compared to 52% by the "once stage 3, always stage 3" methodology. Table 2, on the following page, compares the two methodologies by demographic categories.

Table 1. Stage of HIV infection for prevalent HIV infection cases, "once stage 3, always stage 3" vs. most recent CD4 count or percent

	<i>STAGE 3 PREVALENCE</i>							
	HIV infection non-stage 3		HIV infection stage 3 (AIDS)		Unknown*		TOTAL	
	Num	Percent	Num	Percent	Num	Percent	Num	Percent
<i>METHODOLOGY</i>								
Ever stage 3	7,169	48%	7,912	52%	--	--	15,081	100%
Stage 3 based on most recent CD4	11,144	74%	2,789	18%	1,148	8%	15,081	100%

* "Unknown" pertains only to the "stage 3 based on most recent CD4" methodology, as these cases do not have a reported CD4 count or percent with which to determine stage of HIV infection. By the "ever stage 3" definition, any person who does not meet stage 3 criteria is classified as "HIV non-stage 3."

When considering most recent CD4 count or percent, white persons and men who have sex with men (MSM) make up a smaller proportion of those with stage 3 infection compared to the original method. Black persons and injection drug users (IDU) make up larger proportions. This is a possible indication that black persons and IDUs are less likely to increase their CD4 levels after a stage 3 diagnosis than are white persons and MSM.

Table 2. Comparing demographic characteristics of prevalent HIV infection cases by two different stage 3 methodologies

	STAGE 3 PREVALENCE					
	Ever stage 3		Stage 3 based on most recent CD4		TOTAL	
	Num	Percent	Num	Percent	Num	Percent
RACE/ETHNICITY[§]						
White	2,666	34%	773	28%	5,094	34%
Black	4,568	58%	1,751	63%	8,765	58%
Hispanic	360	5%	149	5%	651	4%
Multi/Other/Unk	318	4%	116	4%	571	4%
SEX & RACE						
Male	6,232	79%	2,188	78%	11,725	78%
White Male	2,385	30%	693	25%	4,455	30%
Black Male	3,315	42%	1,282	46%	6,332	42%
Hispanic Male	285	4%	120	4%	508	3%
Other Male	247	3%	93	3%	430	3%
Female	1,680	21%	601	22%	3,356	22%
White Female	281	4%	80	3%	639	4%
Black Female	1,253	16%	469	17%	2,433	16%
Hispanic Female	75	1%	29	1%	143	1%
Other Female	71	1%	23	1%	141	1%
RISK[¶]						
Male-Male Sex (MSM)	3,953	50%	1,303	47%	7,500	50%
Injection Drug Use (IDU)	785	10%	325	12%	1,294	9%
MSM/IDU	325	4%	104	4%	576	4%
Blood Products	55	1%	17	1%	81	1%
Heterosexual Contact (HC)	1,417	18%	484	17%	2,682	18%
HCFR (Males)	297	4%	109	4%	509	3%
HCM (Females)	1,120	14%	375	13%	2,173	14%
Perinatal	69	1%	24	1%	174	1%
Undetermined	1,308	17%	532	19%	2,774	18%
AGE AT HIV DIAGNOSIS						
0 - 12 years	79	1%	28	1%	198	1%
13 - 19 years	314	4%	137	5%	798	5%
20 - 24 years	923	12%	394	14%	2,217	15%
25 - 29 years	1,251	16%	457	16%	2,562	17%
30 - 39 years	2,886	36%	994	36%	5,048	33%
40 - 49 years	1,735	22%	548	20%	2,989	20%
50 - 59 years	588	7%	178	6%	1,034	7%
60 years and over	136	2%	53	2%	232	2%
Unspecified	0	0%	0	0%	3	<1%
AREA OF RESIDENCE AT DIAGNOSIS[*]						
Detroit Metro	5,165	65%	1,842	66%	9,776	65%
Out-State	2,372	30%	770	28%	4,595	30%
Prison/Unknown	375	5%	177	6%	710	5%
TOTAL	7,912	100%	2,789	100%	15,081	100%

[§] Persons described as white, black, Asian/Native Hawaiian/Pacific Islander, or American Indian/Alaska Native are all non-Hispanic; persons described as Hispanic may be of any race. The category "Multi/Other/Unk" includes persons described as multi-racial, Asian/Native Hawaiian/Pacific Islander, American Indian/Alaska Native, or of unknown race.

[¶] Risk categories used in Michigan are redefined as of January 2012. NOTE: Heterosexual contact for males includes only males whose sexual partners are known to be HIV infected or at high risk for HIV (HCFR). Heterosexual contact for females includes all females who have had sex with a male regardless of what is known about the male's HIV status or behaviors (HCM).

^{*} Detroit Metro Area consists of Lapeer, Macomb, Monroe, Oakland, St. Clair, and Wayne Counties. The remaining counties comprise the Out-State area.