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CD4 Counts of Nonperinatally HIV–Infected Youth and Young Adults Presenting for HIV Care Between 2002 and 2010

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Human immunodeficiency virus (HIV) incidence is increasing among youth, particularly young men who have sex with men and racial/ethnic minorities. Earlier presentation to care, a goal of public health initiatives, can limit immune deterioration and HIV transmission. We determined if fewer nonperinatally HIV (nPHIV)–infected youth are presenting for care at lower CD4 counts.

Methods

This was a retrospective study of nPHIV-infected 12- to 24-year-olds presenting for care at HIV Research Network (HIVRN) sites between 2002 and 2010.[1] The 13 geographically distributed sites that contributed data over the study period all had institutional review board approval for the study (from Alameda County Medical Center, Children's Hospital of Philadelphia, Community Health Network, Drexel University, Johns Hopkins University, Montefiore Medical Group, Montefiore Medical Center, Oregon Health and Science University, Parkland Health and Hospital System, St. Jude's Children's Hospital and

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Author Contributions: Dr Agwu had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
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Acquisition of data: Voss.
Analysis and interpretation of data: Agwu, Neptune, Yehia.
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University of Tennessee, St. Luke's Roosevelt Hospital Center, Tampa General Health Care, University of California, San Diego, and Wayne State University). Eligible patients, who provided informed consent (oral or written depending on the rules of the approving institutional review board), had at least 1 CD4 value and were antiretroviral therapy naive. To assure exclusion of patients who received care previously, we excluded patients whose first recorded HIV-1 RNA level was less than the limit of detection of the used assay or less than 2.6 $\log_{10}$ HIV-1 RNA copies/mL (n = 174); patients whose first CD4 or HIV-1 RNA measurement preceded clinic enrollment by more than 45 days (n = 200); and those with incomplete data (n = 2; unable to rule out prior antiretroviral therapy). The primary outcome was a presenting CD4 count less than 350 cells/mm^3. Multivariate logistic regression assessed demographic and clinical factors associated with the outcome. Given the large proportion of males, we also conducted a male-only subgroup analysis.

Results

One thousand four hundred ninety-seven nPHIV-infected 12- to 24-year-old youth presented to care at HIVRN sites (Table 1). The proportion with a presenting CD4 count less than 350 cells/mm^3 remained between 30% and 45% over the study period (*P* trend >.05). Black race (adjusted odds ratio [AOR], 2.03 [95% CI, 1.31–3.15]), Hispanic ethnicity (AOR, 1.69 [95% CI, 1.21–2.34]), male gender (AOR, 1.63 [95% CI, 1.16–2.30]), heterosexual acquisition risk (AOR, 1.43 [95% CI, 1.08–1.88]), higher HIV-1 RNA level, and increasing age (AOR, 1.14 [95% CI, 1.06–1.23]) were independently associated with a greater likelihood of a presenting CD4 count less than 350 cells/mm^3 (Table 2). These findings remained consistent in the male-only subgroup analysis (Table 3).

Discussion

Between 2002 and 2010, there was no overall improvement in presenting CD4 count among nPHIV-infected youth at HIVRN sites, contrary to data in adults.[2,3] The trend in youth may be related to continued risk behaviors in this population related to developmental and cognitive stage, in addition to testing and engagement challenges. As in adults, racial/ethnic minority status is associated with lower presenting CD4 count among youth, particularly young men who have sex with men, a population at the forefront of the youth epidemic. While recent data show improvements in racial/ethnic disparities in adults,[3] our data demonstrate no apparent improvement over the past decade for youth. The gender disparity among youth is opposite to that in adults.[2,3]

Female youth may access health care more frequently than males, in part because of reproductive and gynecologic/obstetric needs,[4] which may increase opportunities for HIV testing and linkage to care. More effective methods to recruit at-risk male youth into early testing and linkage to care are needed.

Heterosexual acquisition was also associated with an increased likelihood of presenting with a CD4 count less than 350 cells/mm^3, highlighting a potential gap in outreach efforts because they may engage in high risk behaviors and not perceive that they are at risk and thereby test and present for care later.[5] Lastly, higher HIV-1 RNA level, which increases

risk of progression to AIDS, was associated with a presenting CD4 count less than 350 cells/mm^3. Of concern is that significant proportions of youth, who often continue to engage in high-risk behaviors,[6] had high HIV-1 RNA levels, increasing HIV transmission risk.

The study has some limitations. Socioeconomic data are not collected by HIVRN, and mental health and substance abuse data are incomplete and were not evaluated. A limited number of 12- to 16-year-olds, injection drug users, or heterosexual males were in the cohort. Last, some patients may have presented for care previously at other sites.

Conclusions

The proportion of nPHIV-infected youth presenting to HIVRN sites with a CD4 count less than 350 cells/mm^3 remained essentially unchanged between 2002 and 2010. Minority, male, and heterosexual youth may warrant innovative strategies to target these populations.

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Table 1

Demographic and Clinical Characteristics of Nonperinatally HIV-Infected Youth (Aged 12–24 Years) at Presentation to Care at HIVRN Sites (2002–2010)

	No. (%)										
	2002 (n = 107)	**2003 (n = 105)**	**2004 (n = 124)**	**2005 (n = 136)**	**2006 (n = 117)**	**2007 (n = 195)**	**2008 (n = 222)**	**2009 (n = 234)**	**2010 (n = 257)**	**Total (n = 1497)**	***P* Value**
Age at presentation, y, median (IQR)	21 (19–23)	22 (15–23)	22 (20–23)	21 (19–23)	22 (20–23)	21 (19–23)	21 (20–23)	21 (20–23)	21 (19–23)	21 (20–23)	.39
Race/ethnicity											
Black	59 (55.1)	55 (52.4)	65 (52.4)	71 (52.2)	77 (65.8)	118 (60.5)	140 (63.1)	157 (67.1)	168 (65.4)	910 (60.8)	.13
White	22 (20.6)	21 (20.0)	30 (24.2)	21 (15.4)	17 (14.5)	30 (15.4)	38 (17.1)	38 (16.2)	36 (14.0)	253 (16.9)	
Hispanic	25 (23.4)	29 (27.6)	26 (30.0)	38 (28.0)	17 (14.5)	41 (21.0)	40 (18.0)	33 (14.1)	42 (16.3)	291 (19.4)	
Other/unknown	1 (0.9)	0	3 (2.4)	6 (4.4)	6 (5.1)	6 (3.1)	4 (1.8)	6 (2.6)	11 (4.3)	43 (2.9)	
Male	72 (67.3)	81 (77.1)	81 (65.3)	100 (73.5)	76 (73.5)	150 (76.9)	168 (75.7)	192 (82.0)	219 (85.2)	1149 (76.7)	<.001[a]
HIV acquisition risk											
MSM	49 (45.8)	65 (61.9)	65 (52.4)	77 (56.6)	64 (54.7)	127 (65.1)	137 (61.7)	172 (73.5)	190 (73.9)	946 (63.2)	<.001[a]
HET	49 (45.8)	31 (29.5)	54 (43.5)	53 (39.0)	49 (41.9)	63 (32.3)	80 (36.0)	60 (25.6)	61 (23.7)	500 (33.4)	
IDU	9 (8.4)	9 (8.6)	5 (4.0)	6 (4.4)	4 (3.4)	5 (2.6)	5 (2.3)	2 (0.9)	5 (1.9)	51 (3.4)	
CD4 count, cells/mm^3											
<200	18 (16.8)	19 (18.1)	21 (16.9)	26 (19.1)	13 (11.1)	39 (20.0)	35 (15.8)	29 (12.4)	34 (13.2)	234 (15.6)	.14
200–<350	13 (12.1)	27 (25.7)	31 (25.0)	28 (20.6)	30 (25.6)	49 (25.1)	58 (26.1)	65 (27.8)	55 (21.4)	356 (23.8)	
350–<500	35 (32.7)	23 (21.9)	42 (33.9)	42 (30.9)	44 (37.6)	59 (30.3)	66 (29.7)	70 (29.9)	82 (31.9)	463 (30.9)	
≥500	41 (38.3)	36 (34.3)	30 (24.2)	40 (29.4)	30 (25.6)	48 (24.6)	63 (28.4)	70 (29.9)	86 (33.5)	444 (29.7)	
HIV-1 RNA, $\log_{10}$ copies/mL											
2.6–<4.0	32 (29.9)	32 (30.5)	42 (33.9)	39 (28.7)	29 (24.8)	56 (28.7)	74 (33.3)	79 (33.8)	75 (29.2)	458 (30.6)	.001[a]
4.0–<4.7	30 (28.0)	34 (32.4)	30 (24.2)	37 (27.2)	36 (30.8)	57 (29.2)	67 (30.2)	86 (36.8)	80 (31.1)	457 (30.5)	
4.7–<5.0	11 (10.3)	11 (10.5)	21 (16.9)	16 (11.8)	12 (10.3)	27 (13.8)	27 (12.2)	33 (14.1)	34 (13.2)	192 (12.8)	
≥5.0	27 (25.2)	22 (21.0)	26 (21.0)	27 (19.9)	37 (31.6)	51 (26.2)	50 (22.5)	28 (12.0)	58 (22.6)	326 (21.8)	
Missing	7 (6.5)	6 (5.7)	5 (4.0)	17 (12.5)	3 (2.6)	4 (2.0)	4 (1.8)	8 (3.4)	10 (3.9	64 (4.3)	
Site of care											

	No. (%)										
	2002 (n = 107)	**2003 (n = 105)**	**2004 (n = 124)**	**2005 (n = 136)**	**2006 (n = 117)**	**2007 (n = 195)**	**2008 (n = 222)**	**2009 (n = 234)**	**2010 (n = 257)**	**Total (n = 1497)**	***P* Value**
Pediatric	16 (14.9)	15 (14.3)	10 (8.1)	25 (18.4)	15 (12.8)	17 (8.7)	19 (8.6)	32 (13.7)	30 (11.7)	179 (12.0)	.09
Adult	91 (85.1)	90 (85.7)	114 (91.9)	111 (81.6)	102 (87.2)	178 (91.3)	203 (91.4)	202 (86.3)	227 (88.3)	1318 (88.0)	

Abbreviations: HET, heterosexual; HIV, human immunodeficiency virus; HIVRN, HIV Research Network; IDU, injection drug use; IQR, interquartile range; MSM, men who have sex with men.

[a] Significant.

Table 2

Factors Associated With CD4 Count Less Than 350 Cells/mm^3 at Presentation for Care to HIVRN Sites

Factor	Univariate OR (95% CI)	Multivariate[a] AOR (95% CI)
Race/ethnicity		
White	1 [Reference]	1.0 [Reference]
Black	1.22 (1.01–1.48)[b]	2.03 (1.31–3.15)[b]
Hispanic	1.12 (0.97–1.30)	1.69 (1.21–2.34)[b]
Male	1.60 (1.37–1.86)[b]	1.63 (1.16–2.30)[b]
Age at presentation	1.12 (1.07–1.16)[b]	1.14 (1.06–1.23)[b]
HIV acquisition risk		
MSM	1 [Reference]	1 [Reference]
HET	0.91 (0.80–1.03)	1.43 (1.08–1.88)[b]
IDU	0.51 (0.32–0.80)[b]	0.85 (0.41–1.76)
HIV-1 RNA, $\log_{10}$ copies/mL		
2.6–<4.0	1 [Reference]	1 [Reference]
4.0–<4.7	1.95 (1.45–2.63)[b]	2.00 (1.54–2.59)[b]
4.7–<5.0	3.54 (2.50–5.02)[b]	3.78 (2.54–5.64)[b]
≥5.0	7.11 (5.61–9.00)[b]	8.40 (6.82–10.3)[b]
Missing	2.58 (1.21–5.50)[b]	2.50 (1.18–5.28)[b]

Abbreviations: AOR, adjusted odds ratio; HET, heterosexual; HIV, human immunodeficiency virus; HIVRN, HIV Research Network; IDU, injection drug use; MSM, men who have sex with men; OR, odds ratio.

[a] Multivariate logistic regression adjusted for year presented to care, gender, race/ethnicity, age at presentation, HIV acquisition risk, viral load, region, and site.

[b] Significant.

Table 3

Factors Associated With CD4 Count Less Than 350 Cells/mm^3 at Presentation for Care to HIVRN Sites: Subgroup Analysis of the 1149 Males in the HIVRN Cohort

Factor	Univariate OR (95% CI)	Multivariate[a] AOR (95% CI)
Race/ethnicity		
White	1 [Reference]	1 [Reference]
Black	1.36 (1.08–1.72)[b]	2.14 (1.25–3.64)[b]
Hispanic	1.08 (0.89–1.31)	1.75 (1.18–2.59)[b]
Age at presentation	1.11 (1.08–1.14)[b]	1.15 (1.08–1.22)[b]
HIV acquisition risk		
MSM	1 [Reference]	1 [Reference]
HET	1.53 (1.20–1.97)[b]	1.42 (1.04–1.94)[b]
IDU	0.58 (0.35–0.95)[b]	0.77 (0.39–1.51)
HIV-1 RNA, $\log_{10}$ copies/mL		
2.6–<4.0	1 [Reference]	1 [Reference]
4.0–<4.7	2.00 (1.20–3.32)[b]	2.08 (1.27–3.41)[b]
4.7–<5.0	3.31 (2.24–4.89)[b]	3.61 (2.38–5.48)[b]
≥5.0	6.39 (4.44–9.21)[b]	7.63 (5.40–10.8)[b]
Missing	2.57 (1.38–4.77)[b]	2.29 (1.15–4.54)[b]

Abbreviations: AOR, adjusted odds ratio; HET, heterosexual; HIV, human immunodeficiency virus; HIVRN, HIV Research Network; IDU, injection drug use; MSM, men who have sex with men; OR, odds ratio.

[a] Subgroup analysis of males: multivariate logistic regression adjusted for year presented to care, race/ethnicity, HIV acquisition risk, age at enrollment, viral load, region, and site.

[b] Significant.